British Light Helicopter
Operations during the
Falkland
Islands Campaign

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Richard K. Tierney
Editor

Honorable John O. Marsh Jr.
Secretary of the Army

The mission of the *U.S. Army Aviation Digest (USPS 415-350)* is to provide information of an operational, functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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THIS ISSUE contains a variety of excellent, interesting articles which you'll find to your liking.

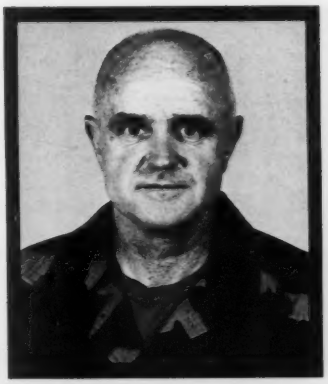
We can benefit from reading the "British Light Helicopter Operations During the Falkland Islands Campaign," the lead article written by LTC David W.A. Swan. The British Liaison Officer to Ft. Rucker describes the organization, tactics and logistics employed in their helicopter operations. In addition, this factual account of lessons learned reveals the performance of weapons and equipment never before used in combat and the great flexibility gained by the British through extensive use of helicopters. I urge you to read this crisp account to see how we can improve our combat readiness, gaining by the British experience.

"Shaping the AirLand-Echeloned Battlefield With Army Aviation" conceptualizes the key roles of the helicopter in a variety of tactical situations. Major Charles Cook sees aviation as a ground system of the land Army that exploits the vertical aspects of the battlefield. He visualizes helicopter operations and force structures in the main, deep and rear areas and is convinced that the army that capitalizes most fully on the helicopter's countless possiblities will win decisively.

Major Ralph Aaron provides a roundup of near term flight, weapons and combat mission simulators. The "alternative" allows us to offset some flying hour and ammunition costs and provides for an ability to train the most critical maneuvers and operations repetitively; meanwhile, we save our fleet wear and tear, ready for any contingency.

I acknowledge the fine article by SFC William Hawkins; "Aviation Safety and the NCO" addresses our NCOs, the "backbone of the Army." SGT Hawkins encourages maintenance NCOs to better manage soldiers by their own positive attitudes, job knowledge and personal actions. The personal touch down the line can directly impact on flying safety.

Before you fly again, be sure to read "The Ice Storm Cometh" in this issue. Although some readers (geographically) are not as likely to encounter icing conditions as others, weather is frequently fickle and when unexpected, this phenomenon can be perilous if you're not prepared to deal with it.



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British Light Helicopter Operations during the Falkland Islands Campaign

PART I : The Deployment

Lieutenant Colonel David W.A. Swan AAC
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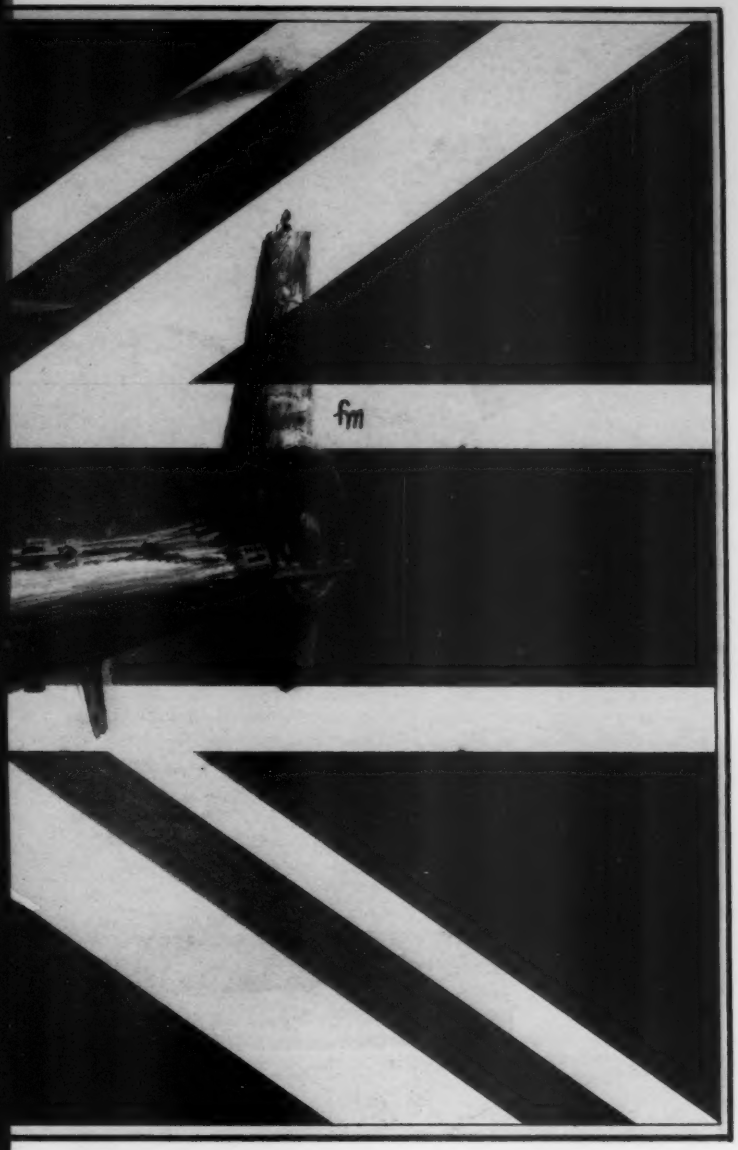
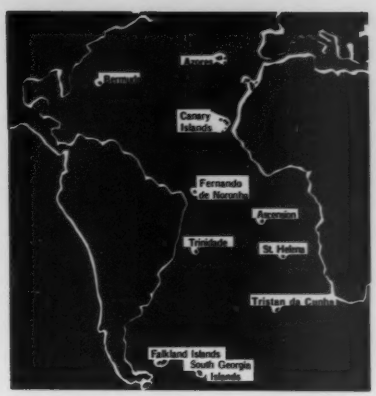




Falkland Islands and South Georgia Island.

It is now 16 months since the United Kingdom regained the Falkland Islands and South Georgia from Argentina which had illegally invaded and occupied the territory. The campaign attracted the attention of the whole world and it has since been the subject of debate and comment as nations have tried to glean as much information as they could on the lessons learned from the activities of the opposing forces, their tactics and the performance of their weapons and equipment. Much of the weaponry had not been previously used in a combat situation.

Many newspaper and magazine articles, even books, appeared on the shelves of bookstores soon after the campaign was over, trying to analyse the results of the battles. Some were well informed, and some not. However, one common thread appeared in all of them and that was the acknowledgment that without fit, well-trained troops—*and the extensive use of helicopters*—the campaign would have posed even greater difficulties than those which actually faced commanders and troops on the ground. The bad weather, the poor terrain which virtually denied the use of all except specialised forms of ground transportation, and the movement of the mass of logistic supplies to support the advancing units would have added to the length of the campaign had it not been for the contributions made by the helicopter force. As one infantry battalion commander stated, "helicopters were the life blood of the campaign."

Notwithstanding the acknowledged importance of helicopters during the campaign, very little has actually appeared in writing describing their use, the problems they faced and the lessons the Army Air Corps (AAC) learned or relearned during those hectic 2 months. This article attempts to redress that balance and I propose to go into some depth on the organisation, tactics and logistic aspects of the helicopter operations and recount some of the incidents that took place.

I must, of course, say straight away that I was not actively involved in the campaign, but in my position as British Liaison Officer at the U.S. Army Aviation Center, Ft. Rucker, AL, I received a great deal of information on the progress of the campaign. My sources of information are many and varied, including Headquarters Director Army Air Corps, Middle Wallop in England and Major Colin Sibun, AAC, Officer Commanding 656 Squadron Army Air Corps, and Major Andrew Eames, Royal Marines, Operations Officer, Commando Brigade Air Squadron (Cdo Bde Air Sqn), both of whom took an active part in the campaign and who visited Ft. Rucker in January 1983 to give a series of excellent briefings and personal insights into the campaign. I must acknowledge their assistance and that of many other individuals in preparing this article.

Organisation

Before I describe the organisation of the aviation units which took part in Operation Corporate (the code name for the military operation), I need to point out certain differences in the overall concept of helicopter support in the British Services as compared with U.S. Army Aviation. The British Army has its own integral air support provided by the AAC which is a full branch, in U.S. terms, having its own complete officer and enlisted structure, all wearing the AAC capbadge and uniform. The aircraft it operates are scout and antitank helicopters. The AAC is organised into regiments (equivalent to aviation battalions), the majority being deployed permanently in Germany, and independent squadrons, the majority of which are permanently based in UK. A regiment normally supports a division and a squadron supports a brigade.

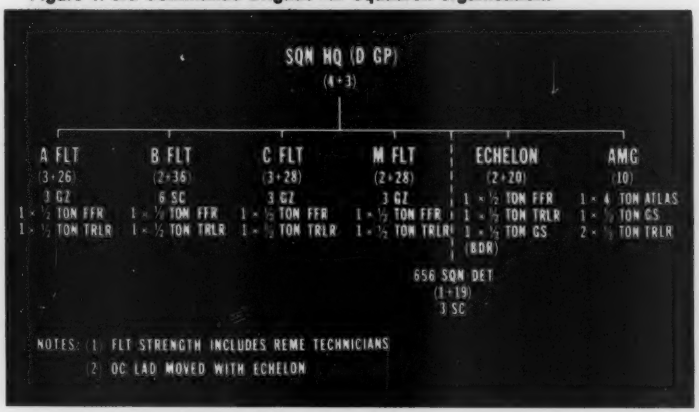
The Royal Marines have their own Cdo Bde Air Sqn which is larger and organised slightly differently to an AAC squadron, but which operates basically the same type of aircraft. In fact, the Army is responsible for the procurement of aircraft for the Cdo Bde Air Sqn and trains its pilots.

The Royal Marines and the Army do not have their own integral utility and cargo helicopter lift capability. This support is provided by the Royal Air Force (RAF) to the Army and by the Royal Navy (RN) to the Royal Marines as required. During the course of this article I touch briefly on the operations of the RN and RAF support helicopters, as they are generically known in UK, but I concentrate mainly on the light helicopters of the AAC and the Cdo Bde Air Sqn.

Maintenance support of Royal Marine and Army aircraft is provided by another branch of the Army, the Royal Electrical and Mechanical Engineers (REME). Each AAC regiment and squadron has its own Light Aid Detachment (LAD) of REME technicians responsible not only for 1st Line (AVUM) servicing of aircraft but also of vehicles and certain other equipment items in the unit. 2nd Line Support (AVIM) is provided by Aircraft Workshops REME which have the capability of deploying detachments (Aircraft Maintenance Groups (AMGs)) as required. Although REME provides maintenance support for the whole Army, the aircraft servicing personnel are fully integrated into aviation and aviation units and wear the same light blue beret as the AAC, however they affix their own capbadge.

The land force initially deployed to the Falklands under Operation Corporate was the 3rd Commando Brigade Royal Marines (3 Cdo Bde) which was part of the amphibious group and which made the initial beach landings at San Carlos on 21 May 1982. The Cdo Bde Air Sqn, which is an integral part of the brigade, also deployed at the same time. Subsequently the land forces were reinforced by 5th Infantry Brigade (5 Bde) and Headquarters Land Forces Falkland Isles (HQ LFFI), thus forming a small division. 5 Bde, based in UK, had no integral aviation assets and was therefore assigned an AAC squadron, 656 Squadron AAC (656 Sqn AAC), normally part of 1st Infantry Brigade.

Figure 1: 3rd Commando Brigade Air Squadron organisation.



The organisation of the Cdo Bde Air Sqn during Operation Corporate is shown at figure 1. The squadron was limited to about two-thirds of its normal strength by the amount of shipping space available. It consisted of a squadron headquarters which forms part of HQ 3 Cdo Bde, three flights each of three Gazelle light observation helicopters and one flight of six Scout (that is the Westland Scout not to be confused with the generic term of scout used in U.S. Army Aviation) antitank/utility helicopters. Each flight is capable of deploying separately. Also placed under command of the Cdo Bde Air Sqn, for the initial deployment, was a detachment of three Scout helicopters from 656 Sqn AAC, with the rest of the squadron following later.

656 Sqn AAC was organised as shown in figure 2 and this is the standard organisation of an independent AAC squadron. It consists of a small headquarters which includes a liaison officer detached to brigade headquarters, a headquarters section, two flights each of six helicopters and a REME LAD. One flight consists of Gazelle helicopters and the other of Scout antitank helicopters. The detachment of three Scout helicopters which had gone ahead with the Cdo Bde Air Sqn returned under command of its parent squadron when 656 Sqn AAC disembarked in the Falklands.

Each squadron was reinforced by an AMG from 70 Aircraft Workshops REME which provided the necessary 2nd Line (AVIM) support to the units. Eventually the two AMGs were combined and set up a base workshop facility at the beachhead at San Carlos.

The support helicopters were provided by the detachments from squadrons of the Fleet Air Arm and the RAF. These included Wessex, Sea King and Chinook helicopters. In all, almost 200 helicopters of seven different types, including the AAC and Cdo Bde Air Sqn aircraft, were deployed for Operation Corporate.

Equipment

The two types of aircraft used by both the Cdo Bde Air Sqn and 656 Sqn AAC were the Gazelle and the Scout.

The Gazelle is our reconnaissance and observation helicopter, or scout. Manufactured in UK under licence from Aerospatiale, France, it is a fast, agile aircraft with a good performance but although it is nominally a five-seater its folding back seat is very cramped. Certain modifications were carried out to the Gazelle helicopters for Operation Corporate but, in the short time available to mount the operation, it was not possible to fit all of the Gazelle with all the proposed modifications, which included the following:

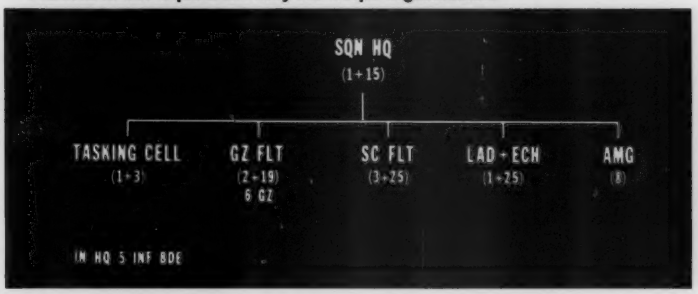
- Flotation gear.
- Radar altimeter.
- I band transponder for operation with ships.
- Identification friend or foe (IFF).
- MATRA "SNEB" 68 mm rocket system.
- SFENA stability augmentation system (SAS).
- Blade folding capability.
- Increasing the Maximum All Up Weight (AUW) allowance to 1,800 kilograms (3,970 lbs).

The Westland Scout has been in service with the AAC since the early 1960s as our light utility aircraft. Subsequently it was fitted with SS-11 antitank guided missiles and a roof mounted sight for antiarmour operations in Germany. It is now being replaced by Lynx equipped with TOW (tube-launched, optically-tracked, wire-guided) missiles, but a conscious decision was made not to deploy Lynx to the Falklands as, firstly, the aircraft is fairly new into service and, secondly, it would have reduced our antiarmour contribution to NATO in Germany. In fact, notwithstanding the size of the force deployed under Operation Corporate, our overall contribution to NATO was unaffected.

The Scout is a simple, rugged, reliable helicopter with a good sized cabin for carrying stores or casualties and a useful payload under operational conditions of about 1,000 pounds. However, being old technology, it has a thirsty engine and at or near maximum AUW it has very limited endurance.

AAC Gazelle AH1.

FIGURE 2: 656 Squadron Army Air Corps organisation.



AAC Scout fitted with SS-11 missiles and roof-mounted sight.

Modifications proposed for the Scout were similar to those for the Gazelle with the exception of the SAS, but again it was not possible to complete them all. Its operational maximum AUW allowance was also increased by a further 200 pounds.

Needless to say there was tremendous cooperation between the services and industry to try and complete the preparations in time. The fitting of the SNEB rockets to the Gazelle was a classic example. There was no previous design for this modification, but it took just over a week from the time the decision was taken to arm the aircraft to delivery of the first completed kits. This involved consultations with MATRA, the manufacturers in France, delivery of the parts to UK, modifications to the aircraft by Westland Helicopters Ltd., test flying and test firing and finally clearance for shipboard operations. As a corollary to that story, the Cdo Bde Air Sqn, having received the kits, sent a message requesting the assistance of an expert to help with the installation. The prompt reply was "once you have fitted and fired the rockets you are the experts!"

In addition to the aircraft modifications, other role equipment was also taken. This included SS-11 missiles, waist mounted 7.62 mm machine guns for the Scout, Infrared Counter Measures shields for both types of aircraft, a limited number of 1st generation night vision goggles, floor armour, stretchers for both internal and external, and camouflage covers. Aircraft spares were scaled for 30 days usage at intensive flying rates with an identical pack held at 24 hours readiness in UK. Battle casualty replacement (BCR) aircraft and crews were nominated and held at readiness in UK.

Command and Control

Throughout the campaign the two brigades carried out the mission tasking of their own aircraft. HQ LFFI, once it was established, contained a Supporting Arms Coordination Cell (SACC) in which was included a staff officer for light helicopters (S02 Lt Hels) and the support helicopter tasking cell. The tasks of the S02 Lt Hels were as follows:

- Advice to the commander on light helicopter operations.
- Coordination of light helicopter mission requests from within HQ LFFI and Force Troops in accordance with laid down operational priorities.
- Monitoring the usage and loss rate of light helicopters and calling forward BCRs as required.
- Assistance in the management of forward airspace.
- Assistance to the support helicopter tasking organisation.

The SACC was responsible for the coordination of forward airspace and a deconfliction height of 50 feet above ground level was established, fixed wing above and helicopters below. All Air Defence systems were to be weapons tight for helicopters, due to the lack of a potent enemy helicopter threat, but weapons free for fixed wing.

Two Gazelle were provided on a daily basis from the two brigades in support of HQ LFFI and Force Troops. Although these aircraft were vital, particularly to the commander and his staff for visits forward to the brigades, the system became increasingly difficult to operate as the two aviation squadrons moved farther forward with the advancing troops and transit time increased. Further complications arose over tasking these aircraft due to the problems of not having a dedicated light helicopter radio net at HQ LFFI and static interference on the radios, for example HF at night. In retrospect it would probably have been better to have had a self-contained flight of three Gazelle permanently attached to HQ LFFI for their own use.

Communications

I mentioned in the previous paragraph the lack of a dedicated light helicopter radio net at HQ LFFI. This was a disadvantage in many ways and was caused by a shortage of radio facilities in the cramped Amphibious Operations Room of *HMS Fearless* where HQ LFFI was installed. The two aviation squadrons did operate their own VHF (FM) radio nets within their brigades and sometimes HQ LFFI was able to join these nets whereupon light helicopter mission tasking became much easier. UHF was used but inhibited by the limited frequency range available in the older radios fitted to our aircraft. These radios are currently being replaced and the new radios will overcome this difficulty.

Aircrew cockpit workload, when airborne, was high when taking into account IFF code changing, encoding and decoding transmissions and authentication, while flying at a very low level in a combat environment. The acquisition of up-to-date communications information for helicopter crews proved extremely difficult and was to cause considerable problems when conducting missions. It was a fast moving battle; codes and frequencies changed rapidly as did unit and ship

LEFT: Royal Navy Sea King MK 5.

BELOW: RAF Chinook HC MK 1.

locations. The crews therefore kept their radio transmissions to the minimum and gained much of their information by landing at forward unit headquarters for up-to-date briefings and carrying the information back to higher headquarters. The use of report lines and nicknames over the radio was considerably quicker and more effective than working with complex coding systems when airborne.

It is therefore reasonable to assume that aircrew workload could have been considerably reduced had there been some form of automatic data storage and retrieval system installed in the aircraft, linked to a similar ground based system.

Preparation and Training

It is obvious that there was little time to carry out a great deal of preparation and training for Operation Corporate because of the speed with which the campaign was mounted. In fact the installation of many of the aircraft modifications was continued during the long sea voyage south and the 2-week pause at Ascension Island.

The Cdo Bde Air Sqn, because of its role with 3 Cdo Bde, was trained for shipboard operations and of course the brigade as a whole is trained for amphibious assaults which was why it was selected to spearhead the operation. On the other hand the normal role for 656 Sqn AAC did not require it to train for shipboard or amphibious operations nor were its aircraft equipped for this purpose. Therefore a considerable effort was required to modify aircraft and train the crews.

656 Sqn AAC was not normally part of 5 Bde and was therefore operating with a new formation. Fortunately it was possible to allow 5 Bde a brief 2-week workup period before it embarked and 656 Sqn AAC took full advantage of this opportunity to become familiar with the brigade's standard operating procedures and to get to know the units with which they would be operating as well as conducting its own training.

The forecast problems of vehicle movement over the uninviting Falklands terrain and limitations on shipping space resulted in a total ban on all except essential vehicles such as radio and command post vehicles. The Officer Commanding 656 Sqn AAC was therefore left with a surplus of drivers. Thinking in terms of local defence he used these drivers, together with the squadron storemen, cooks and pay staff, to form a defence platoon. They trained as such during the workup period and during the sea voyage and by the time the squadron arrived in the Falklands he had an effective unit. The platoon was divided into three sections for the local defence of the squadron headquarters and the two flights and gave much needed security to the unit.

Night operations were being anticipated and there was obviously going to be a requirement for night vision goggles. Unfortunately only a very limited number were available, some going to the support helicopters and the remainder to the aviation squadrons. Even then there were insufficient to fully equip one squadron. Such as were available were divided between both squadrons, but only the Cdo Bde Air Sqn was able to train with them during the voyage south, so that by the time they arrived in the operational area at last some of the squadron's crews had reached an acceptable level of proficiency.

In addition to the pure aviation preparations and training, there was a considerable effort to improve individual skills, such as small arms shooting, first aid and, of course, a heavy emphasis on physical fitness. This latter aspect was to prove essential and contributed greatly toward the successful outcome of the campaign.

Next month:
Part II: The Battle

Shaping the AirLand-Echeloned Battlefield

with Army Aviation

Major Charles B. Cook

THE HISTORY of land warfare has demonstrated frequently and clearly the rapid manner in which technological breakthroughs can afford distinct tactical advantages to those nations capable of exploiting such developments. Those armies blessed with the acquisition of new dimensional weapons—and innovative leaders with the necessary tactics to employ them—have traditionally achieved rapid, sometimes stunning successes. Although appropriate countermeasures were invariably devised, the time available today to react to such technical and tactical surprises in the event of war no longer exists for all practical purposes. In the future, those armies that neglect to take advantage of potential technical or tactical breakthroughs, or the support programs designed to develop them, risk putting themselves into the unenviable position of not being able to protect their nation's vital interests if suddenly called upon to do so.

The modern armies of the world today are faced with an extremely vexing dilemma—having re-

The helicopter plays a vital role in shaping today's vertical dimension of land warfare and is essential to a decisive victory.

illustration courtesy of King Radio Corporation

quirements for new weapons of constantly increasing combat power (and resultant breakthrough potential) yet having to make increasingly difficult choices as to their affordability. The emergence of the helicopter has not simplified this dilemma. Indeed, it has introduced a new dimension to the battlefield as complex and costly as any newly introduced weapon system of the past, to include mechanization and NBC (nuclear, biological, chemical) weapons. Most modern land armies are now rapidly moving to adopt in some fashion the relatively new air assault concept and to better exploit the vertical aspects of the battlefield. A costly new factor, yet because of the implications involved, current AirLand-Echeloned operational concepts as espoused by the United States and the Soviet Union are heavily incorporating the use of the helicopter. It could probably even be argued that these evolving concepts, which emphasize retention of the initiative, agility and the tempo of combined arms operations throughout the depth of a greatly expanded battlefield, are only made possible through the use of the helicopter. Because of its mobility and firepower, the helicopter tends to keep the maneuver concept a more viable capability on today's firepower intensive, antitank oriented battlefields.

Currently both superpowers' operational concepts basically share the same ideas in spite of the defensive-offensive/east-west orientations and military jargon involved. Combined arms operations, rapidity of maneuver, retention of the initiative and depth of operations characterize both of their capabilities and intentions. Similarly, over time, both the United States and the USSR have seemed to move toward common philosophies concerning the exploitation of this new vertical dimension of land warfare. Perhaps key to this common philosophy is the concept that although an aviation system, the helicopter functions best as a ground system and an integral component of their land armies—as a combined arms entity perhaps best called "Army Aviation."

As a mutually employed, operationally subordinate component of the land army ground force, Army Aviation units offer a considerable number of options with which to exploit *flexibly* the vertical aspects of the battlefield. The Army Aviation concept also tends to provide solutions to the nagging problems which have existed concerning how to interface properly the combat power available from one's land and air forces.

In addition to its capability of moving with ground force units and an independence from large, fixed operational and support bases, the helicopter has shown itself to be capable of being employed in roles and missions unique to its environment on the battlefield. Accordingly, this new "layer" of the battlefield is having an immediate impact on current operational art and tactical theories. Traditional concepts of land warfare are being modified or replaced and new ones introduced in order to adapt to the presence of this new weapon system. As a major factor of this new vertical dimension to land warfare, the helicopter will exert a considerable influence on the shape of any future AirLand-Echeloned Battlefield. It will *directly* influence the manner in which battles are fought and will play a major role in their outcome. As today's operational concepts have evolved on either side of the Iron Curtain, land warfare operations featuring this third dimension and a fourth one, time, have been classified into three general battle areas—a main battle area (MBA), a deep battle area (DBA) and a corresponding rear battle area (RBA). Since the helicopter now plays such a key role within the operational theories and force structures pertaining to tactical operations in these areas, it is useful to pause and review how this new weapon system will tend to shape such battle areas in the future.

Main Battle Area

As the name implies, the main battle historically has been where the main clash between two opposing forces initially occurs (figure 1). It will continue to be the point of main effort for the identifiable future and normally will be a region of strategic/tactical interest along a line of contact between two opposing forces. As land armies commit their forces into increasingly more complex, integrated and deadly battles, the MBA will be marked by intense efforts to manipulate and control operations conducted within it. Once committed to such a battle, any combatant has only one intention—to win decisively. In order to accomplish this, requisite combat power advantages must be rapidly achieved and sustained. Surprise, speed, momentum, protection of one's force, combined arms operations and the ability to be responsive to changes in the direction of the battle, regardless of terrain or weather, are key tasks. The ability to seize and retain the initiative while using the above principles to rapidly outmaneuver and overpower an opponent will ensure decisive victories. Within the MBA or covering force area either side of the line of contact, use of the helicopter in support of these principles serves as a new means with which to influence the outcome of battles fought in this area. Its unique capabilities are rapidly

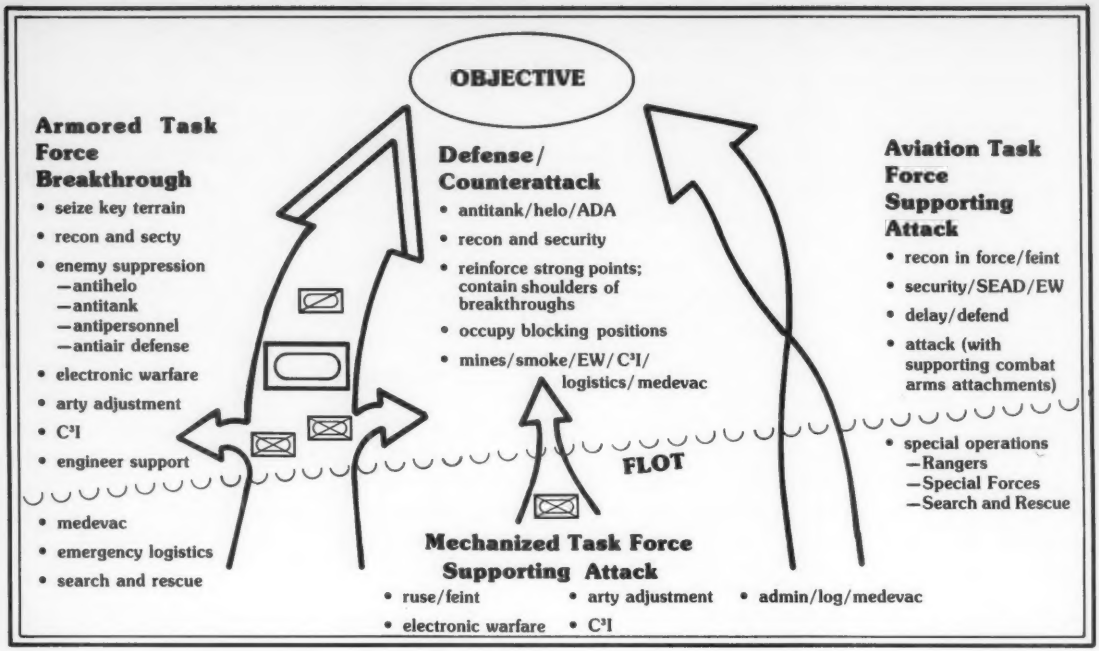


FIGURE 1: Helicopter roles in the Main Battle Area.

task organized into the combined arms forces operating in the MBA and enhance their overall capability to conduct combat operations.

In the offense, the helicopter will provide advance warning and security through its reconnaissance role. In its armed role, it will provide immediate, mobile, diversified firepower. As an integrated component of task organized, combined arms motorized/armored forces, armed helicopters lend unique support to either main or supporting attacks, raids, feints or ruses. Those countries with the more sophisticated, albeit more expensive, multipurpose attack helicopters will profit the most from their varied ordnance loads capable of being employed—antipersonnel, antitank or antiaircraft. These same multipurpose systems are also the most survivable and have the greatest all-weather capabilities.

The seizure of key terrain or movement of reinforcements to hold the shoulders of penetrations or the conduct of mop-up operations will be requirements capable of being met by assault helicopters. Faster moving, wider ranging aviation task forces will be logistically supported by dedicated transport helicopters. Emergency logistical requirements in support of ground forces will be met by use of assault/transport helicopters as an alternative mission.

Within this key main battle area, other traditional combat requirements such as command and control, timely and accurate adjustment of artillery fires, and emergency medevacs will continue to be enhanced with use of the helicopter. New roles such as electronic warfare support will augment traditional intelligence efforts to see the battlefield and allow commanders to control and manipulate the electronic combat power available to them. Smoke and obscurant generation, minelaying and the employment of air assault antitank/air defense teams will protect the flanks of attacking forces. Helicopters in their various roles will

allow Army Aviation units to serve as decisively in the future as have Artillery, Armor or Infantry units in the past as attacking forces generate the combat power necessary to defeat their opponents in the MBA.

Similarly, the defense of the main battle area will be characterized by the integrated use of Army Aviation units within the organization of the overall defense. Defensive schemes will continue to make maximum use of the terrain, time and troops available but face greatly increased pressures due to the significantly expanded nature of modern battlefields. Adequate plans for the defense of the MBA will depend heavily upon the helicopter's mobility and reaction capability in the execution of its many potential roles and missions. An effective, modern combined arms defense would prove to be difficult, if not impossible, without Army Aviation units available as part of the troop list.

Not capable of being counted on as a force multiplier if both sides have the freedom to employ equal numbers and types of helicopters, the helicopter due to its mobility is capable of providing the reaction capability necessary to begin off-setting the attacker's initial advantage in choosing where, when and how to strike. Its firepower will be one of the first means available to the defender with which to strike back selectively at vulnerable gaps and flanks of attacking forces. As in the offense, operating in its vertical component of the battlefield, it offers the defender a new prospect or method of wresting the initiative away from an opponent and stopping an attack. Capable of being used "offensively" in the defense, Army Aviation's ability to move troops and equipment, provide firepower, support engineer and electronic warfare (EW) operations, expedite reconnaissance efforts and provide a means of mobile communications, command and control offers considerable leverage to the defending commander.

In the main battle area, the helicopter will prove to have a profound effect on how well defensive or offensive operations are conducted by modern combined arms forces. This system, operating in its environment within the MBA, offers considerable flexibility and weight to any proposed course of action. It also poses considerably greater complexities when such proposals are wargamed against similarly equipped opponents. Prudent commanders and staffs will look for innovative means to organize Army Aviation's strengths into their operational plans for seizing and maintaining control of all three dimensions of the MBA.

Deep Battle Area

The greatly expanded nature of today's battlefields, as promulgated by current AirLand-Echeloned theories, results in numerous opportunities for Army Aviation forces to play decisive roles throughout a commander's area of influence. Major clashes between opposing land armies will no longer be restricted to those battles fought along the forward line of troops (figure 2). The capability of defeating an opponent throughout an area of operations such that neither counterattack nor coordinated defense is possible has always been a major objective of any tactical commander tasked with the mission of rapidly defeating an opponent. The ability to conduct significant, simultaneous combat operations in an enemy's vulnerable rear areas greatly expands the battlefield and can prompt the quick collapse of an opponent's will to resist even if his main defenses are still relatively intact. Helicopters have now developed to the point in terms of survivability that they offer considerable breakthrough potential in allowing the conduct of such DBA operation beyond the MBA.

Helicopter supported operations will impose tremendous pressures on any defensive plan's capability to survive simultaneous assaults along the MBA and into rear areas. Retention of the initiative, surprise and better use of the terrain are powerful factors with which to ensure operations of much greater tempo in today's firepower heavy, antitank system dominated battlefields. Army Aviation forces have the ability either to move with tank heavy formations, protecting and reinforcing their successes in a combined arms deep battle operation, or to move directly into rear areas and conduct autonomous air assault combined arms operations themselves. Operating with or without paradrop delivered reinforcements and supporting weapon systems, these autonomous deep operations

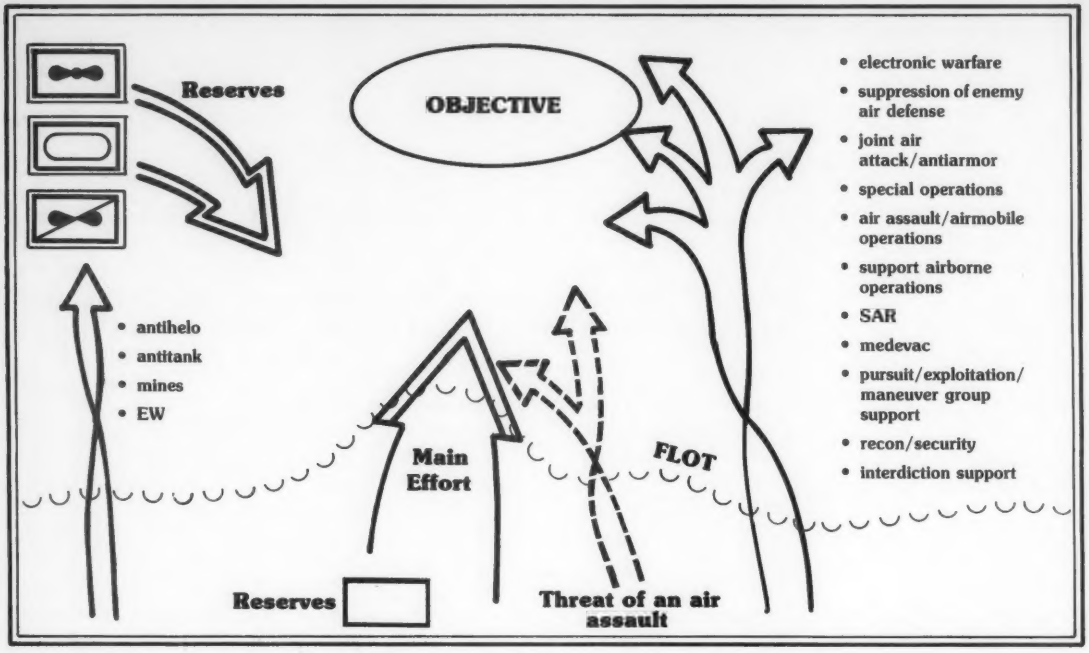


FIGURE 2: Helicopter roles in the Deep Battle Area.

may or may not be organized to link up with similar helicopter supported, deep-striking armor operations depending on the situation and the mission of the other ground forces involved.

Offensive efforts within the MBA will be tremendously enhanced by deep battle operations whether they are conducted in direct support of MBA objectives or as they are conducted in the rear areas of an opponent. Either tactic greatly disrupts the overall defensive posture of the enemy. Destroyed or delayed counterattacks, jammed and confused command, control, communications and intelligence (C^3I), destroyed or damaged special weapon sites, air defense sites and other logistical or tactical support bases are significant factors which tend to produce the sudden collapse of an opponent. The capability of the helicopter to support such attack-in-depth operations is probably its greatest contribution to modern warfare.

Notwithstanding its obvious utility in low intensity conflicts, the helicopter's potential contribution in shaping the outcome of future mid to high intensity battlefields is even more important. The prospect of having to allocate limited defensive assets to stop main and supporting attacks with large follow-on reserve support and simultaneously defending against battalion to division size units in vulnerable rear areas is cause for deep concern. Unfortunately, this prospect is not a probability but a guaranteed eventuality due to the proliferation of modern, designed-for-combat helicopter systems and Army Aviation equipped forces.

Rear Battle Area

Armor-attack helicopter heavy forces rapidly conducting envelopments into vulnerable rear areas or airmobile air assault forces moving around, over or even underneath carefully prepared and positioned defenses established to defeat the main attack should adequately point to the problem of RBA defense (figure 3). Fortunately for the defense, one of the primary reasons for causing such concern also presents an adequate solution of the problem. Having equal mobility,

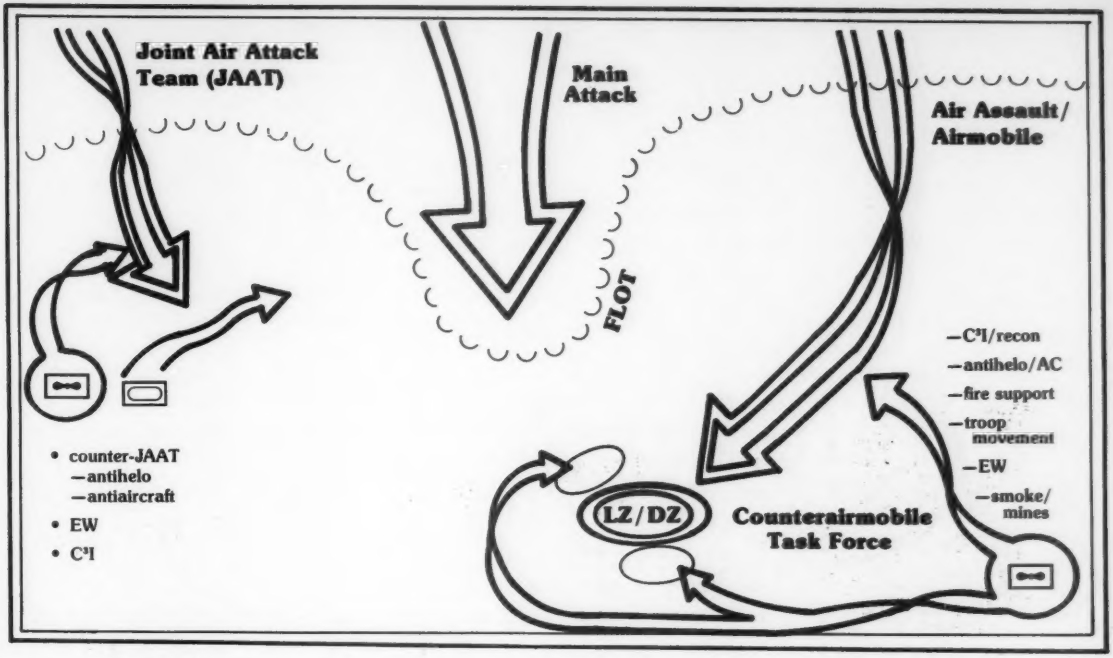


FIGURE 3: Helicopter roles in the Rear Battle Area.

firepower and capable of providing the C³I necessary to detect, react to and initiate preplanned counterattacks against such offensive tactics, helicopter equipped forces may be committed against such deep battle operations much sooner than conventional ground system counterattacks. Army Aviation task forces working with preplanned, task organized air and land forces have the capability to begin counterattack operations while enemy deep battle efforts are still in progress or preferably attempt to preempt them prior to their execution. Without such assets of equal mobility, equal or greater firepower and preplanned C³I measures, attempts to contain offensive operations using currently evolving deep battle tactics which link helicopters with armor and/or airborne forces, or into groups of task organized air assault units, could prove to be futile using traditional weapons and tactics. The helicopter's constantly increasing survivability and adverse weather capability and firepower combined with its inherent ability to react rapidly from key tactical locations and to fly on a management-by-exception basis in spite of incredibly complicated airspace management problems proves it to be a critically important weapon for the defense. Without its support as an immediately available combined arms system, would-be attempts to defeat larger attacking forces using the same helicopter systems previously discussed would result in fighting from a position of unacceptable risk and great jeopardy. Overpowering synergistic forces can be brought to bear on opponents lacking in similar capabilities or tactics with very unfortunate consequences. Thus, the rear area battle properly prepared for, while simultaneously conducting operations in the MBA and the opponent's own rear areas, will prove to be an extremely challenging and mandatory scenario for professional military planners in the future.

Conclusion

As battlefields continue to grow more complex over time, this new look at the vertical dimension of land warfare continues to reveal new ideas to be exploited.

Attempts to gain relative advantages over one's opponent will continue to be reflected in a search for equilibrium within this new layer of the battlefield. Land armies will find it increasingly important, even mandatory, to control this new development in warfare and deny it to their opponents. The exploitation of such under-exploited areas as air-to-air weapons, tactical air-to-surface missiles, and sophisticated, emerging C³I and EW management systems will prove to be vital. Army Aviation forces will reinforce tactical land army air defense/suppression of enemy air defense (SEAD) measures in addition to augmenting overall Air Force strategic and theater roles of air superiority and SEAD. The evolving use of remotely piloted vehicles and airborne warning and control system type assets combined with a constantly expanding automated C³I capability points toward continually changing tactics in the near to mid term as measures are sought to best employ Army Aviation's continuously developing capabilities into combined arms force structures. These new technological developments are particularly well suited for adoption to fast moving Army Aviation equipped forces.

Another point that bears retrospection is how the development of doctrinal, training and logistical bases tends to lag during the rush to acquire and employ new combat power producing systems and forces such as the Army Aviation concept. Losing a battle or war due to a faulty operational concept is no different than having an audacious breakthrough (with forces intact in the face of a retreating, collapsing enemy) falter because of insufficient logistical support. Both instances are distinct points in any campaign where momentum and initiative are capable of being lost—only to be regained at great cost. If the full benefits are to be derived from newly conceived fast moving "tooth heavy" combat forces such as the tank-attack helicopter operational maneuver group or airmobile air assault task force, dedicated equally fast moving logistical tails will be required. Large logistical helicopters and low flying tactical air transport craft will meet such requirements if employed primarily in this role. To use such assets routinely in support of MBA units with already established, dedicated supply lines will be far less profitable. Commanders and staffs at all levels of the land army are now charged with planning strategies and tactics which must take into account not only a significantly expanded manner of execution but also significantly expanded logistical and training requirements.

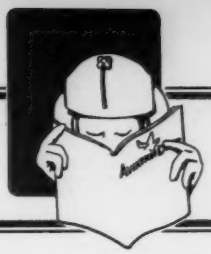
Army Aviation will have a significant influence on how wars will be fought through the rest of this century and the beginning of the next. This new template laid across the battlefield will allow old techniques to work even better, but more importantly it is a new system which can now be employed in new ways. As a new tool, the principles of war may be used to manipulate the shape of future battlefields as significantly as have the machinegun and tank in the past.

The measures and countermeasures introduced to the art of war because of the helicopter and this Army Aviation entity have been subject to great debate and analysis. The primary conclusion to be drawn from the introduction of the helicopter and its performance to date, from the last days of World War II to the conflicts in the Falklands and the Bekaa Valley, is that it is here to stay. Those responsible for making war or keeping the peace are now responsible for incorporating this new weapon into an already complex combined arms force structure. To fail to take maximum advantage of its potential will be to offer an opponent the first method with which to begin the dismantlement of one's own defenses. The future is obvious for those who have accepted this new concept of Army Aviation. For those who have not accepted the idea or have just begun to experiment with the idea, one must only consider the possiblities with it, or more importantly, the alternatives without it.

ABOUT THE AUTHOR

Major Charles B. Cook, Aviation, is currently serving as a rotary wing aircraft tech-intell officer with the Defense Intelligence Agency. He received a B.S. from the University of Alabama and is a graduate of the U.S. Army Command and General Staff College. He has authored several previously published articles concerning the employment and development of rotary wing aircraft to include a thesis assessing the Soviet combat helicopter threat. MAJ Cook has served in a variety of command and staff positions in previous operational assignments.

VIEWS FROM READERS



Editor:

I would like to express my appreciation for the outstanding article "Why Me?—The Threat Officer" on threat published in the April 1983 *U.S. Army Aviation Digest.* This article clearly illustrates the criticality of Army aviators being properly trained for effective mission operations in the threat environment.

I am surprised, though, that a member of the Army Aviation Center would prepare such an informative article without providing "the rest of the story." Allow me to provide some additional information.

The Army Aviation Center is the TRADOC proponent for a group of equipment systems and philosophies called aircraft survivability equipment (ASE). The philosophies include nap-of-the-earth flight, lusterless paint schemes to blend in with the operational background, and hardening of aircraft components to allow continued safe operation after sustaining damage from threat systems. Equipment systems include threat radar detectors, jammers and other countermeasure devices.

These philosophies and equipment systems have been and are being developed for incorporation on current and future field Army aircraft to enhance their ability to survive mission operations in the threat environment. ASE systems are deployed to applicable priority aviation units after they have been thoroughly tested to assure their effectiveness.

The current edition of FM 1-101, "Aircraft Battlefield Countermeasures and Survivability," provides some information on how to operate the ASE systems to enhance mission survivability. This manual is currently being revised by the Aviation Center to incorporate additional threat operations and ASE system operational information. Additionally, the Aviation Center is developing ASE system operational training courses to be included in the applicable aviator training programs.

The tactical radar threat generator (TRTG) AN/TPQ-T4 has been developed as a device for training aviators with in-flight operational use of the AN/APR-39 series Radar Warning Receiver Systems. A limited quantity of TRTGs is in the field with actions in process to procure additional systems. Additional training devices, identified as being required to support the above indicated ASE system operational courses, will be developed and fielded at the earliest possible time.

I hope the above information will be passed on to your readers to show that the Army is serious about providing aviators with the capability to survive mission operations in the intense threat environment. All of these philosophies, equipment and training devices are useless, however, without actual field unit training on how to effectively operate the aircraft and its installed mission equipment (to include ASE) to complete required missions in a threat environment.

J.W. Dean
Logistics Management Specialist
Aircraft Survivability Equipment
Project Manager's Office

Editor:

If it is possible I would like to have a transcript of an article that appeared in *Aviation Digest* sometime in the first half of 1970. It was entitled "Stay Clear of Hue." I was one of those involved in the action about which the article was written, and I would deeply appreciate this transcript.

Henry Steffes
Lynnwood, WA

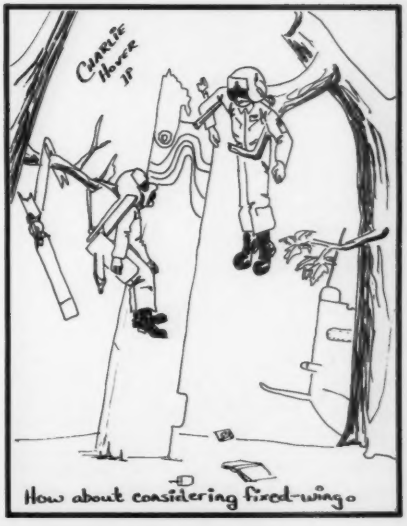
Editor:

After reading your article "The First Book of Rucker" I was honestly shocked! Since joining Army Aviation 7 years ago I have enjoyed reading your magazine each month. It is sad to see it go along with the countless other publications of this day that "poke-fun" at GOD, the BIBLE and Christians!

I would just like to go on record as saying that I see no reason for such nonsense, and I hope that in the future articles like this will not find their place in *Aviation Digest.*

SGT Lindal R. Cossey
568th Trans Co.
Ft. Wainwright, AK

• Neither the original skit nor the adaptation was intended to poke fun at God, the Bible or Christians. Our apologies to anyone who felt the format was offensive.



Articles from the *Aviation Digest* requested in these letters have been mailed. Readers can obtain copies of material printed in any issue by writing to: Editor, *U.S. Army Aviation Digest,* P.O. Drawer P, Ft. Rucker, AL 36362

The ice storm cometh

U.S. ARMY SAFETY CENTER

INDIAN SUMMER—crisp leaves underfoot, the smell of woodsmoke in the air, and sounds of Saturday afternoon football games—winter is still long way off. But not in some parts of the world, for some of you winter is here, right now, with all of its problems and dangers to aircraft and their crews.

This article is not intended to tell you everything you always wanted to know but were afraid to ask about winter flying. It is rather a reminder that winter is here and no matter how much experience you have, a review of cold weather operations is in order *before* you encounter the additional hazards of winter weather conditions.

Aviators are warned that "Aircraft will not be flown into known or forecast severe icing conditions." Army Regulation 95-1, "Army Aviation General Provisions and Flight Regulations," further states that "If a flight is to be made into known or forecast moderate icing conditions, the aircraft must be equipped with adequate deicing or anti-icing equipment." The regulation does not prohibit flying when light icing is a possibility. Unless local supplements to the AR restrict such flights, the pilot must make the decision. The importance of the mission must be weighed against the possibility of worsening weather and accumulating ice. A foremost consideration in this judgment call is the safety of the aircraft and the crew.

Rapidly changing weather is the greatest hazard to cold weather flying, not only for the beginner but for the experienced pilot as well. In one case, a Huey pilot encountered unforecast icing less than ½-mile from the end of the runway. Within 30 seconds ice had obscured windshield visibility except for two 6-inch squares in the lower left and right corners. This pilot's decision to turn back immediately may have saved the aircraft and the crew.

Icing is most common when the temperature is between 32°F/0°C and -4°F/-20°C and visible moisture such as clouds, drizzle, rain or wet snow is present. Icing is rarely experienced in those areas which maintain temperatures of -20°C or below.

Weather conditions that normally cause icing to occur are as follows:

- Stratiform clouds indicate stable air in which minute water droplets and/or ice crystals are suspended. Water droplets may become supercooled at or below freezing and still be in a liquid state. Supercooled droplets freeze on contact with air and form layers of ice. The suspended ice crystals are not hazardous to flight because they will not adhere to the aircraft.
- Icing in cumuliform clouds with high moisture content can occur rapidly. Unstable air with currents may carry large supercooled droplets which spread before freezing, causing rapid accumulation of ice.
- Icing in mountainous terrain occurs mainly when moist air is lifted over high peaks. Ice-producing areas are usually on the windward side of peaks to about 4,000 feet above the peak, and possibly higher when the air is unstable.
- Icing in frontal inversions also can be rapid. Temperatures are normally colder at higher altitudes; but when air from a warm front rises above colder air, freezing rain may occur. Rain falling from the upper (warmer) layer into a colder layer is cooled to below freezing, but remains a liquid. The liquid freezes upon contact with the aircraft, and accumulation may be very rapid (figure 1).

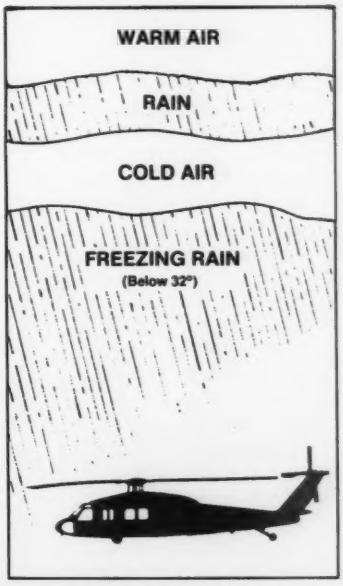


FIGURE 1.-Rain freezes upon contact.

The first sign that your aircraft has entered icing conditions will be ice on the windscreen. But like all rules, this one has exceptions. An anonymous pilot's account in *Flight Comment,* the Canadian Armed Forces flight safety magazine, emphasizes how unexpected icing can endanger helicopters and their crews.

> Sure is odd to get fog when it's this cold I think to myself. Feeling our way along the road that has been cleverly disguised as an enormous snowdrift, I suddenly get the feeling that the collective (up-down lever for you starchwing types) setting is unusually high for the speed and aircraft weight. A quick glance down at the instruments tells me that my TOT is also very high. What the ____! I had been watching for any indication of ice accumulation on the windscreen and antennas—but nothing. When in doubt land as soon as possible, I think. With a thump we're down (it's a good thing there's a high transient unintentional TOT permitted). During shutdown things start to vibrate quite badly with chunks of ice flying off the main rotor as it coasts down. When the main rotor finally stopped I couldn't believe my eyes. Ice covered the entire rotor system—heaviest towards the tips and tapering towards the hub—a crusty ice in excess of ½-inch thick at places. The tail rotor was even worse—again tapering from the tips but in places well over 1-inch thick. How stupid could I be to fly under such conditions? It was ignorance. Ignorance of items of information that should have been basic to the trade—and yet were not.
>
> Why not?

Even in the worst icing conditions, the side windows normally will not ice over and can provide some visibility. Thanks to this phenomenon, the pilot of a C-12A was able to land his crippled aircraft in fog, although his windscreen was completely iced over.

When icing is encountered, normally descent to an altitude clear of the clouds is advised. However, in freezing rain, it is vital to know the altitude of the inversion layer and the freezing level. The best solution may be to climb through the inversion layer to warmer air above.

Rotor blade icing begins near the blade root. This ice buildup can cause loss of lift, thus requiring an adjustment of power to maintain lift, which will increase the engine operating temperature.

Asymmetrical shedding occurs when one rotor blade sheds ice resulting in an out of balance condition. Severe vibrations may occur as a result of main rotor asymmetrical ice shedding. If icing conditions are encountered while in flight, erratic control movements should not be made in an attempt to remove ice accumulations from the main rotor blades. Shaking the cyclic could place undue stress on the rotor system and lead to even greater imbalance. Ice shedding can also cause foreign object damage from ice ingested into the engine. If icing is moderate to heavy, land as soon as possible. If you cannot land, fly the aircraft to a warmer flight level. Safe autorotational rotor speeds may be lost if ice is allowed to form on the rotor blades. (Check FM 1-230 for additional clarification of structural icing.)

Ground personnel should remain well clear of helicopters during landing and shutdown after flight in icing conditions. Crew and passengers should remain aboard until the rotor blades have stopped. Pieces of ice shed by the main rotor while passing through translational lift during approach to land, as well as at touchdown, have been found as far away as 300 feet from the aircraft.

Ice accumulation increases stalling speed of fixed-wing aircraft. The Federal Aviation Administration (FAA) reports that wind tunnel tests have shown that ice, frost, or snow accumulation on the leading edge and upper surface of a wing, having a thickness and surface roughness similar to medium or coarse sandpaper, can reduce wing lift by as much as 30 percent and increase drag by 40 percent. Tests made in Sweden with small aircraft show that a 1-millimeter layer of hoarfrost on a wing may result in a 50 percent reduction in maximum lift. Even mosquitos deposited along a wing's leading edge during summer operations have considerable effect on the stalling speed of some modern aircraft.

Accumulations of snow, frost, slush and ice while an aircraft is on the ground will adversely affect general aircraft performance, climb performance and stall speeds to a dangerous degree. Pilots of iced aircraft have found that following take-off, once they rose above ground effect, they could no longer sustain flight or maneuver the aircraft without losing control and stalling. Contamination of aircraft components by ice, frost, or snow always has some effect, however, the fine line between a successful take-off or loss of control and stall is sometimes difficult to determine. Consequently, accumulations of snow, frost and ice must be removed from aircraft before take-off.

The crash of Air Florida's Flight 90 into the 14th Street Bridge over the Potomac River in January of 1981 provides a vivid reminder of what ice accumulation on the ground can do to an aircraft. Seventy-eight people died, 74 on the Boeing 737 and 4 others whose vehicles were on the bridge when the plane struck. The National Transportation Safety Board's (NTSB) conclusion as to the most probable cause of the crash was "the flight crew's failure to use engine anti-ice during ground operations and take-off, their decision to take off with snow/ice on the airfoil surfaces of the aircraft, and the captain's failure to reject the take-off during the early stages when his attention was called to anomalous engine instrument reading." Contributing factors included prolonged ground delays, known inherent pitch-up characteristics of the Boeing 737 when the leading edge is contaminated with even small amounts of snow and ice, and the limited experience of the flight crew in jet transport winter operations. According to the FAA, icing accidents are relatively few but the fatality rate is high. Victims are often pilots who are operating in unfamiliar weather conditions for which they have no practical training.

Ice and snow on runways are dangerous for fixed-wing operations. Snow is particularly slippery where temperatures are near freezing. Wet snow or thick slush on runways offers little friction and there is a constant danger of sliding or loss of braking action. Only slight brake pressure should be applied to maintain directional control. Avoid taxiing through puddles or deep snow. Slush or moisture can collect in the wheel assembly and cause the brakes to freeze.

Before taking off in rotary wing aircraft, skids should be checked to be sure they are free from obstruction and have not frozen to the surface. Helicopters produce the greatest amount of rotor wash when hovering, therefore, hovering where there is snow should be avoided. When there are no obstacles, a maximum performance take-off should be made. If it is necessary to clear an obstacle, make a near vertical ascent.

FM 1-202,	"Environmental Flight"
FM 31-70,	"Basic Cold Weather Manual"
FM 31-71,	"Northern Operations"
FM 90-6,	"Mountain Operations"
TC 21-3,	"Soldier's Handbook for Individual Operations and Survival in Cold Weather Areas"
AFM 64-5,	"Survival" (This publication is available from the U.S. Air Force Distribution Center, Baltimore, Maryland 21220)
Operator's Manual and any supplemental local directives	

FIGURE 2.-Publications covering cold weather flight operations.

Unless proper landing procedures are used helicopters can be engulfed in a snow cloud, particularly in powdered snow conditions. The aircraft must be flown in front of the snow cloud until it makes contact with the ground. Loss of outside visual references in helicopters can result in undetected drift, tree strikes, or inadvertent ground contact.

The whiteout phenomenon is not encountered as often by fixed-wing aircraft as by rotary wing aircraft but it can occur, particularly when aircraft are operating in loose snow. As air is drawn in by the propeller, loose snow is lifted and blown rearward over the fuselage creating whiteout.

Whiteout is not a phenomenon peculiar to the novice aviator—high time, proficient aviators who have long experience in flying in snow conditions can still fall victim to this hazard.

A review of winter flying procedures will better prepare you to deal with cold weather problems. The publications listed in figure 2 will refresh your memory or bring you up-to-date on changes. There could be something that will save your aircraft—or even your life. Of course, you will also need to know the capabilities of both your aircraft and your crew. This information, along with the weather conditions at your point of departure, en route, and at destination, is vital to your go, no go, decision as mission pressures build up. One civilian pilot penetrated a drizzling overcast with known icing conditions in an aircraft which was not equipped with deicing gear. His error in judgment almost cost him the lives of his wife and children. He expressed the lesson learned this way, "*A pilot's judgment is reliable only if you weigh all known risks of a proposed flight against the actual threat to human welfare or survival if the flight is not made.*" That's not a bad rule of thumb for any aviator.

REFERENCES

"Airman's Roulette," Nov-Dec 1982 and "Ground Icing," Jan-Feb 1983, *FAA General Aviation News.*

AR 95-1, "Army Aviation General Provisions and Flight Regulations"

FM 1-202, "Environmental Flight"

"Frozen Tips," No. 2, 1983, *Flight Comment*

Roed, Aage, Chief Technical Advisor, Swedish Board of Accident Investigation, "Aircraft Deicing," Oct 1982, *Flight Safety Digest*

"The Hazards of Winter Flying," Oct 1982, *Flying Safety*

How to Lose Your Aviation Career Incentive Pay without even trying!

BEFORE YOU READ this article, I want you to resolve to yourself that you are willing to take the time to correct any deficiencies in your records which may cause you to be over or *under* paid! Now that I have your attention, you need to do two things:

- Get a copy of your latest Leave and Earnings Statement (LES).
- Get a copy of your most recent Officer Record Brief (ORB).

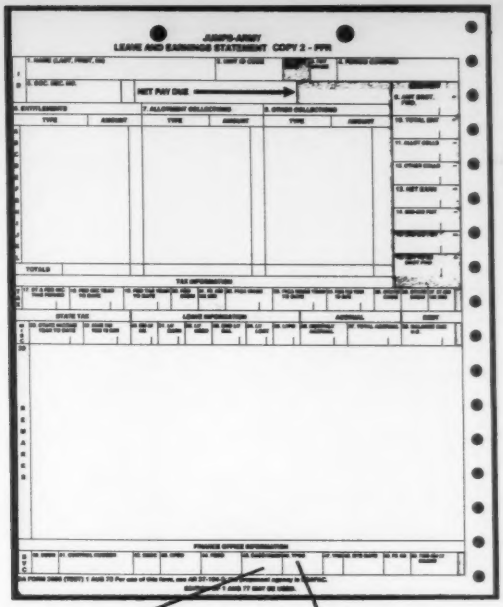
If you don't have one, see your military personnel office. Now that you have these two items, sit down and prepare to inspect them carefully.

Figures 1 and 2 are reproductions of these important documents with areas that you need to "key on" to prevent pay problems. The problem which causes your incentive pay difficulties is encountered when the Aviation Service Entry Date (ASED) and Total Federal Officer Service (TFOS) date do not match on the LES and the ORB. These two items are both used to compute your eligibility for incentive pay and "gate" status.

Check blocks 45 and 46 of your LES with the appropriate blocks of the Aviator Gunnery Qualifications selection on the ORB. Are these two items synchronized? If not, it's time to send out the "Mayday" call and proceed with the following emergency procedures:

- Contact your local finance and accounting office.
- Contact your local military personnel office.
- If you cannot get the problem resolved locally, write to: Commander, MILPERCEN, ATTN: DAPC-OPA-V, 200 Stovall Street, Alexandria, VA 22332. This step can be taken to resolve *any* Aviation Career Incentive Pay data problem, but any request must be accompanied by appropriate documentation to justify the change.

Recently, here at MILPERCEN, we have been able to resolve more than 225 mismatches of ASED and TFOS. This is an ongoing effort which requires extensive research of each case, to pinpoint the exact problem. There are still an estimated 400 cases yet to be resolved. Don't be one of those 400 who suddenly find their flight pay reduced or cut off because of an administrative error. Check your LES and ORB to ensure all the data is valid. The guide to changing any element of the ORB is DA Pam 600-8.



LEAVE AND EARNINGS STATEMENT COPY 2 - PYR

NET PAY DUE

FIGURE 1. Leave and Earnings Statement

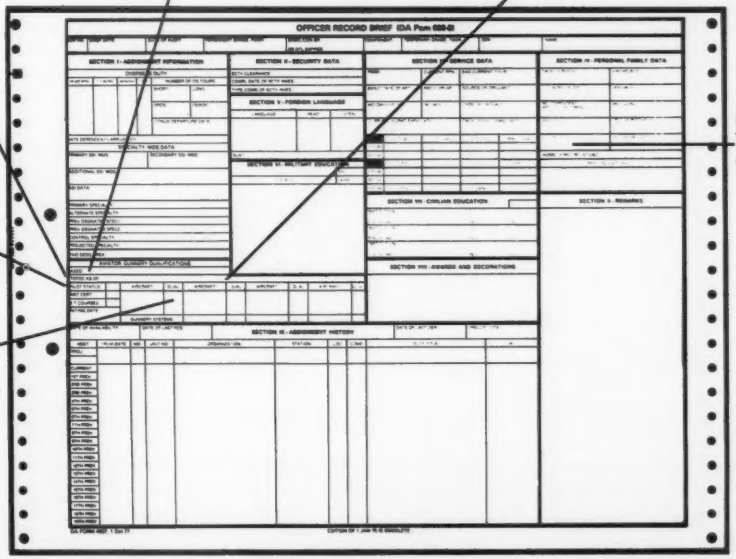
TOFDC (Total Operational Flying Duty Credit). The cumulative number of months an aviator is assigned to operational (not proficiency or nonoperational) flying duty positions.

ASED (Aviation Service Entry Date). The date an officer is first qualified, i.e., on valid orders, for aviation service. Once established, ASED is not normally changed.

TFOS (Total Federal Officer Service). All officer service computed from date of original appointment as a warrant or commissioned officer.

Pilot Status Code
1 = Qualified for Aviation Service
2 = Medically Disqualified
3 = Non-Medically Disqualified
4 = Aviator—Not in Aviation Service

Aircraft Qualification Code
1 = Qualified Aviator
2 = Unit Trained Instructor Pilot
3 = School Trained Instructor Pilot



OFFICER RECORD BRIEF IDA Form 608-B

Date of Physical. This date should change annually.

FIGURE 2. Officer Record Brief

UH-1H FS

CH-47C FS

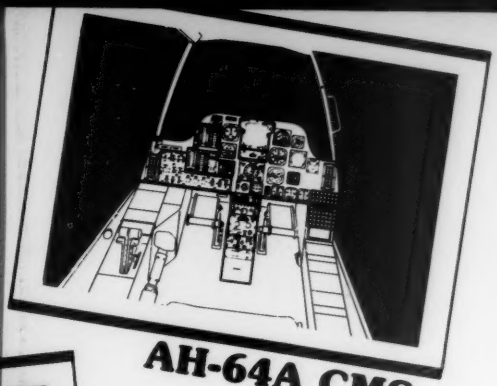
AH-1 FS

UH-60A FS

Flight Simulation

The Alternative

The U.S. Army and particularly Ft. Rucker considers the use of simulators to enhance the development of helicopter training programs as a major breakthrough. Simulator training saves lives and it is cost effective.



AH-64A CMS

Major Ralph P. Aaron
Directorate of Training and Doctrine
New Systems Training Office
U.S. Army Aviation Center
Fort Rucker, AL

DEPARTMENT OF Defense policy is to maintain or increase combat readiness to the extent possible through the use of simulation, miniaturization and substitution. Currently, the U.S. Army training strategy for aircrews includes a simulator program with expenditures exceeding 600 million dollars.

The cost of training and maintaining proficient aircrews is expensive in terms of dollars and training resources. Today, attack helicopter pilot gunnery tables have been established by affordability rather than by required proficiency. Also, many important tasks can't be safely taught in the actual aircraft. The ability to react properly to emergencies, such as loss of components, determines aircrew chances of survivability. Obviously, this type of emergency procedure can't be practiced in an expensive aircraft. Reacting to foreign object damage caused by Threat air defense weaponry is perhaps inevitable during war but is not possible to train for with an actual helicopter or airplane. Common sense demands that alternative training methods be used.

The flight simulator (FS) program is managed at the U.S. Army Aviation Center, Ft. Rucker, AL, by the Directorate of Training and Doctrine, New Systems Training Office, Training Devices Branch. The Training Devices Branch was established on 1 October 1981 with the mission of functioning as the user's representative. Specifically, Training Devices Branch officers transcribe need statements into requirement documents, write acceptance test plans, write (or assist with writing) specifications prior to contract and monitor programs from the need statement throughout the life cycle of the system. Action officers, or systems managers, are assigned to major systems. For example, the AH-1 Cobra systems manager is responsible for all training devices associated with that system. This includes the AH-1 flight and weapons simulator and several part task trainers.

The Army flight simulator program began with Training Device Requirement 0027, approved on 10 July 1967, by a letter from Headquarters, U.S. Army Combat Developments Command. The first simulators were delivered to Ft. Rucker in 1971. The four-cockpit systems replicated the UH-1H Huey configuration. Cost avoidance and enhanced training in these simulators resulted in an additional purchase of 21, four-cockpit UH-1H synthetic flight training systems (SFTS) from the Singer-Link Company. The UH-1 SFTS are all alive, well and still in use—having accumulated more than 811,000 flight hours (as of 25 July 1983) at Ft. Rucker alone.

The next generation of SFTS procured was the CH-47C Chinook prototype SFTS. It was followed by the AH-1 TOW Cobra prototype flight simulator and the UH-60A Black Hawk helicopter simulator. A prototype AH-64A Apache combat mission simulator (CMS) is on the horizon and a training device requirement for a scout attack team trainer has been prepared by the Aviation Center and forwarded to the U.S. Army Training Support Center for staffing.

CH-47 Flight Simulator (CH-47FS)

The prototype Chinook CH-47FS was delivered to Ft. Rucker on 15 December 1976. The CH-47FS consists of one cockpit which includes both student stations and an instructor station as well as a motion system, a computer system and a camera model board visual system. The device may be used for instrument flight rules (IFR) or visual flight rules (VFR) environments. The motion system is 6 degrees of freedom; that is, the aircraft attitude changes in all three axes and the aircraft translational movement in all three dimensions is represented in the aircraft. A video camera and model board are used to provide a visual representation to the pilot through television receivers mounted in the windows of the cockpit. This was the first device to incorporate a visual system.

Singer-Link was awarded a contract in June 1979 for three production model C CH-47FSs. All three devices have been fielded. They, along with the prototype, employ a camera model board visual system.

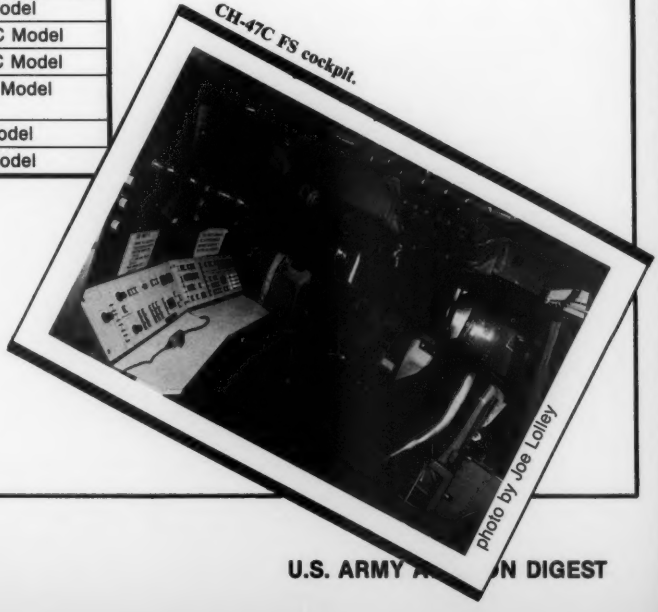
A contract will be awarded in the first quarter of fiscal year (FY) 1984 to modify all fielded CH-47FSs from C model to the D model configuration. This will include conversion of the camera model board visual to a computer generated imagery visual system.

Two additional CH-47FSs, D models, were contracted for in July 1983. The basis of issue plan (BOIP) is at figure 1.

This device is an excellent training vehicle for both transition and continuation training. Practically all aircrew training manual tasks may be practiced in this device. Some examples are ground taxi, takeoff, hovering, standard autorotation, landing, terrain flight, confined area and pinnacle landings, and slingload operations.

FIGURE 1: BOIP for CH-47FS.

UNIT	LOCATION	READY FOR TRAINING
Prototype-1	Ft. Rucker, AL	Aug 77 C Model
2	Ft. Campbell, KY	21 May 82 C Model
3	Ft. Hood, TX	13 Aug 83 C Model
4	Coleman Bks (USAREUR)	3 Dec 82 C Model
5	Ft. Lewis, WA	Apr 86 D Model
6	Korea	Sep 86 D Model



CH-47C FS cockpit.

photo by Joe Lolley

AH-1 Flight and Weapons Simulator (FWS)

The prototype AH-1Q Cobra flight simulator was delivered to the Aviation Center on 22 January 1979. A contract was awarded to Singer-Link on 30 December 1982 to upgrade the device to the AH-1S Modernized Cobra configuration. It is currently used by the Attack Branch for the aircraft qualification course. It is also used by the Active Army, the Reserve, the National Guard and Allied Nations including Israel. This device will be out of service in March 1984, refurbished and ready for training in December 1984.

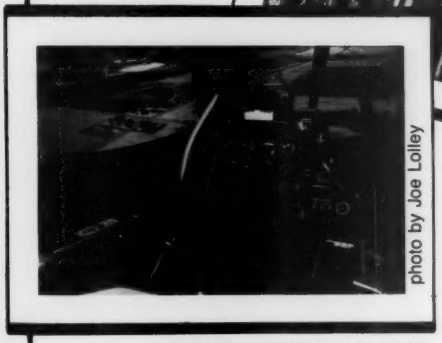
A contract was awarded to the Singer-Link Company on 15 April 1981 to build five AH-1FWS in the AH-1S Modernized Cobra configuration. The AH-1FWS is designed to train normal operating procedures, emergency procedures and gunnery techniques. The trainer consists of two separate cockpits representing the pilot and gunner station, with each cockpit mounted on its own 6 degree of freedom motion system. The entire complex is controlled by five PDP 11/45 computers. Each cockpit is an authentic replica of the actual aircraft from the trainee station forward.

The trainer includes a visual system that provides day and night cues to the pilots as well as weapons effects. The visual system employs a closed circuit laser camera/television system with a three-dimensional terrain model. Two identical 64-foot long by 24-foot high models represent a part of the Ft. Rucker training area about 11 by 4 nautical miles in area. A laser probe, synchronized with cockpit maneuvers, generates the visual image seen by the pilot on a front and side window, and by the gunner on a front window. The two identical terrain boards provide the capability of flying separate training missions for the pilot and gunner simultaneously, or the two cockpits can be linked electronically for crew training.

This device is capable of being used for a myriad of individual and crew training tasks. All weapons will be simulated including the 20 mm, the TOW (tube-launched, optically-tracked, wire-guided) missile and the 10-pound high explosive folding fin aerial rocket. The AH-1FWS has 26 Threats of which any 10 may be programed to be active at any time. Each Threat possesses the capability to engage the crew with either electronic warfare or weapons, to be scored HIT or MISS, and some will display a muzzle flash. The device is a good trainer for night vision goggles and nuclear, biological and chemical tasks. The BOIP is at figure 2.

This is the first device fielded that will allow crews to train in a simulated combat environment.

Visual system terrain model board.



AH-1FS cockpit.

photo by Joe Lolley

FIGURE 2: BOIP for AH-1FWS.

UNIT	LOCATION	READY FOR TRAINING
1	Ft. Hood, TX	May 84
2	Hanau, FRG	Aug 84
Prototype Modified	Ft. Rucker, AL	Dec 84
3	Ft. Campbell, KY	Mar 85
4	Illesheim, FRG	Jun 85
5	Ft. Lewis, WA	Sep 85
*6	Ft. Rucker, AL	Nov 86
*7	Indiantown Gap, PA	Feb 87
*8	Phoenix, AZ	May 87

*Devices 6, 7 and 8 have not been contracted for at this time.

UH-60A Flight Simulator (UH-60FS)

A contract was awarded to the Singer-Link Company on 31 August 1976 to build a prototype Black Hawk UH-60FS. The trainer was delivered to Ft. Rucker in June 1980. The prototype consists of two separate cockpits with independent motion systems. One cockpit has a four-window digital image generation visual system while the other cockpit has a three-window, camera-model system visual. This device is used for the aviator qualification course. Each student receives 6 hours flight time in the UH-60FS from a total program of 15 flight hours.

A development acceptance in-process review was conducted in May 1983 at Ft. Rucker. The decision was made to go into production for 15 UH-60FSs. All production devices will use computer generated imagery. The BOIP is at figure 3.

The UH-60FS is an excellent aid in conducting transition and continuation training. The device will be used for normal and emergency procedures in both VFR and IFR environments.

UH-60A FS cockpit.

UH-60A FS
Computer generated visual scene.

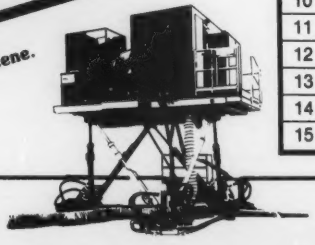


FIGURE 3: BOIP for UH-60FS.

UNIT	LOCATION	READY FOR TRAINING
Prototype	Ft. Rucker, AL	Apr 81
1	Ft. Campbell, KY	Apr 86
2	Ft. Campbell, KY	Jul 86
3	Hanau, FRG	Oct 87
4	Illesheim, FRG	Jan 87
5	Ft. Lewis, WA	Apr 87
6	Ft. Bragg, NC	Jul 87
7	Ft. Hood, TX	Oct 88
8	Korea	Jan 88
9	Germany	Apr 88
10	Korea	Jul 88
11	Ft. Ord, CA	Oct 89
12	Hawaii	Jan 89
13	Ft. Riley, KS	Apr 89
14	Ft. Bliss, TX	Jul 89
15	Indiantown Gap (NG)	Oct 90

AH-64A Combat Mission Simulator

In July 1982 the Army awarded a contract to the Singer-Link Company for a prototype Apache AH-64A CMS. This will be the first synthetic trainer with full sensor integration capabilities applied to a total crew training concept. The prototype will consist of two separate cockpits, one for the pilot and the other for the copilot/gunner. The two cockpits allow the pilots to train separately or as a crew.

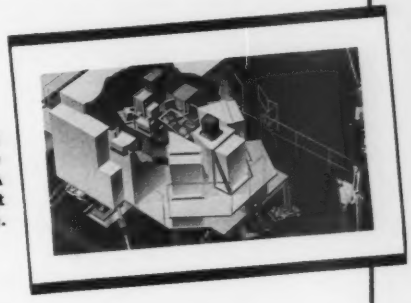
Each cockpit will have an onboard instructor station. Training functions for each cockpit will be controlled from the instructor's station in either an independent or integrated mode.

The simulator will include a visual system to simulate the out-the-window scene as well as a variety of sensor displays. The sensor systems that will be simulated are the forward looking infrared radar visionics associated with the pilot's night vision sensor system and the gunner's Target Acquisition Designation System, as well as the daylight TV system, direct view optics and the Integrated Helmet and Display Sighting System.

The visual requirements for this device exceed the current state-of-the art of visual technology. Because industry wasn't capable of providing the needed visual capability at the time the user needed to begin training, an interim combat mission simulator (ICMS) is being developed as an alternative for the near term. This interim device will totally comply with the user's requirements in all areas except visual and sensor simulation. A simultaneous Visual System Component Development Program (VSCDP) was initiated in May 1981. Once this visual system is developed it will be incorporated into the CMS.

On 7 December 1981, the Assistant Secretary of the Army for Research, Development and Acquisition approved the fielding of a two-station ICMS at Ft. Rucker no later than 1 August 1985 through an accelerated competitive process. As a result of this 2-year production acceleration, prototype technology will be fielded. A preplanned product improvement program will be implemented in conjunction with the VSCDP in the FY 1988 timeframe. The tentative BOIP is at figure 4.

As the early Vietnam era gunship evolved into the "space age" weapons platform of the Apache, so has the philosophy governing the training of attack aircrews. We can no longer afford to fly the actual aircraft or fire its weapon systems in training on a sustained basis. This is especially true for the AH-64 when 1 flight hour costs the American taxpayer roughly $3,000 and one HELLFIRE missile fired downrange costs in excess of $40,000! Also, cost considerations aside, existing ranges and maneuver areas are *totally* inadequate to support realistic combat skills training for AH-64 aircrews. These are the issues which drive the criticality surrounding the accelerated procurement of the combat mission simulator and herald the fact that until the fielding of the CMS, Apache aircrews will be less than adequately trained to perform their missions.



Artist concept of external view of AH-64A CMS cockpit module.

FIGURE 4: Tentative BOIP for AH-64CMS.

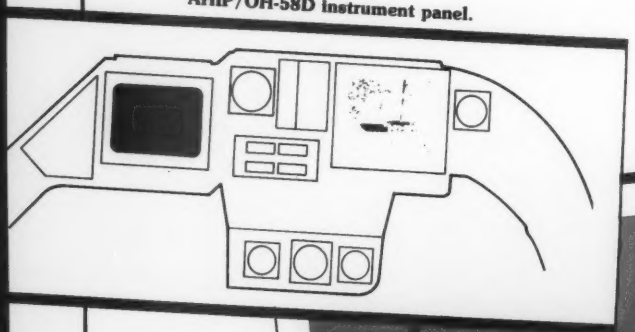
UNIT	LOCATION	READY FOR TRAINING
ICMS	Ft. Rucker, AL	Aug 85
1	Ft. Hood, TX	Aug 86
2	USAREUR	Nov 86
3	Ft. Campbell, KY	May 87
4	USAREUR	Feb 87

Scout/Attack Team (SAT) SFTS

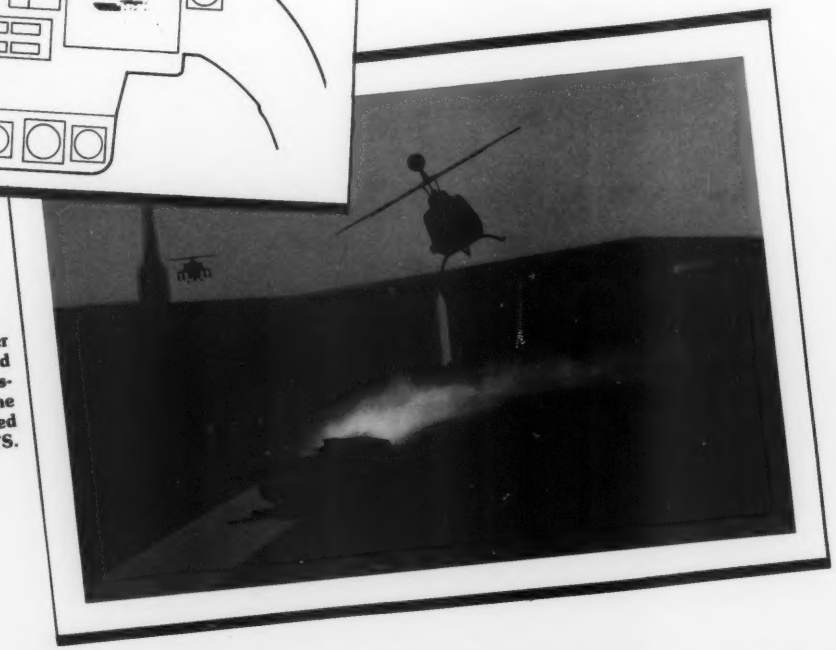
In June 1983, the Aviation Center forwarded a training device requirement to the U.S. Army Training Support Center for staffing. This proposed device would support institution and continuation training by enabling scout/attack team mission task training. The AHIP (Army Helicopter Improvement Program) (OH-58) module will interface with the AH-64 ICMS/CMS and if technically feasible with the AH-1 flight and weapons simulator (Modernized Cobra configuration).

Two related study efforts were contracted for by the Army Research Institute to support front end analysis under the Instructional Systems Development process, as well as to address the concept of training team interface skills in simulation devices. One study is nearing completion. The second study will be complete in the fourth quarter of FY 1984. One major purpose of these studies is to determine the best or most efficient and effective use of this device.

The tentative BOIP will collocate the SAT SFTS with the AH-64 CMS at three locations in the continental United States and at two locations in Europe. If technically possible, the SAT SFTS will also be collocated with AH-1FWS where the AHIP/AH-1S mix is fielded.



Simplified diagram of AHIP/OH-58D instrument panel.



Computer generated combat mission scene from proposed SAT SFTS.

Looking Ahead

Artist concept of LHX cockpit.

One of the major shortcomings of the flight simulator program has been the delay between the fielding of an aircraft system and the subsequent fielding of flight simulators. This time lag is being shortened by parallel development of the aircraft and the flight simulator. A case in point will be the fielding of the AH-64 CMS in August 1985. This will certainly be the best effort in terms of the closeness for fielding of the helicopter and the CMS. Use of preplanned product improvement programs will assist in accelerating the fielding of simulators.

Looking to the future, the Light Helicopter Family is being analyzed by Training Devices Branch for possible development of a flight simulator. Every effort is being made by Training Devices Branch to determine training needs early on, so that training resources are available to the training manager as soon as possible.

Georgia U.S. Congressman Newt Gingrich's views on flight simulators are: "As technology collapses the time and distance of combat while expanding the complexity and capability of the systems used to fight, it becomes more and more difficult to practice to the point of proficiency with the systems and even more difficult to recreate the interaction of these systems with meaningful maneuvers. To avoid the costly mistakes of the past, and to better prepare for the inevitable high speed, high technology, real time decisionmaking type of warfare, it is vital that we turn to simulators. Simulation was originally developed in the military and was only later taken up by civilians, mostly airlines, who are primary users today. Among the three major services the U.S. Army retains its historic lead in the use of simulation. The Army's intensive use of simulators, particularly at Ft. Rucker with the development of helicopter training programs, is a major breakthrough. The objective of simulation is to elevate the competence of the trainee—not just familiarize him with the system, but also to enable him to dominate it. We have focused too long on the hardware element in our security equation, ignoring the vital element that only capable people make the equipment work effectively. Simulation gives us the means to achieve the goal of operational preeminence over our enemies."

As cost of aircraft systems and associated maintenance and training mount, technology has advanced and we have moved more and more into the realm of high fidelity simulation. These devices, in various forms, have paid big dividends in military training for many years. Cost benefits, while impressive, are only part of the story. We also are able to:

- Train up to and—as many pilots will attest—beyond the limits of the actual systems and operators.
- Train, repetitively, the most critical operations and maneuvers.
- Perform detailed after-the-fact analysis of our performance.
- Support mobilization through the capability to extend training days while reducing "wear-and-tear" on the very fleet which we must deploy or use to sustain operations.

While all of the above points are important, the ability to focus on specific training seems evident in the instrument training now done by pilots using the UH-1 SFTS. It is of extreme importance in those aircraft such as the attack systems where crew functions are dissimilar. Many of their duties, because of ammunition cost, range availability, safety, preservation of unique combat assets and lack of opportunities for actual tactical interplay, are *better* performed in a high fidelity flight simulator, even to the point where costs of simulator and aircraft operation begin to converge. While questions of "how much fidelity is enough" remain under study keyed to particular systems and missions, it appears their use will be expanded. Simulators will yield even greater benefits as our training requirements become more complex.

Training Devices Branch Chief—Mr. William Jackson
Training Devices Branch Action Officers:
AH-1S—MAJ Ralph P. Aaron
AH-64A—CPT Ken Carkeet & CPT Jeff Smith
CH-47—Mr. Dick McConnell & CPT Art Siemon-Aparicio
UH-60A—Mr. Dan Bradley
AHIP—Mr. James Stewart & CPT Alan Davison
Training Devices Branch AUTOVON: 558-5619/5910

AR 95-1, Change 1

CHANGE 1, AR 95-1, became effective 15 July 1983. The change was published to add necessary information, correct errors and to attempt to clear up some gray areas. This summary is published in an effort to provide aviators with a better understanding of the reasons for some of the changes.

☐ A significant number of paragraphs were changed to implement the requirements of the maintenance test flight standardization program. You will see references to FE and MTFE throughout the regulation.

☐ The symbol NH will no longer be used to log "night hood" time on DA Forms 2408-12. The primary reason for this change is that DA Forms 759 and 759-1 have no provisions for the symbol.

☐ The military spouse orientation flight program (para 2-6h(5)) has been changed to enhance safety and to cause MACOMs desiring such a program to submit plans to DA for approval.

☐ Paragraph 2-22, maintenance operation check was changed because it was confusing. The new paragraph instructs commanders to train personnel to perform MOCs. It does not say how, when, where or to what extent the training will be conducted. Anyone who is not qualified as a pilot in a specific aircraft must be trained and evaluated by an IP/SIP and have written authorization to start and runup aircraft. The person who starts and runs up an aircraft may or may not be the person performing an MOC. For example, an aviator may start and runup a helicopter while an E5 performs an MOC. The person making the MOC signs it off on DA Form 2408-12. In this case, the E5, not the pilot, signs it off.

☐ "Three months" has been changed to "six months" in paragraph 3-11h. This change reduces the amount of flight time required to put an aviator back into the flight training cycle. If an aviator returns to an aviation assignment before 6 months have elapsed, he/she only needs to become current per paragraph 3-7.

☐ Notice that the sentence "consecutive instruction periods involving autorotation maneuvers will not be scheduled" has been deleted from paragraph 3-12b(3). This sentence was removed because it unnecessarily restricted training.

☐ In an effort to make commanders aware of problems that exist in aviation publications and of the recommended changes made by their personnel, para 3-29 directs that all DA Forms 2028 be sent through the aviation unit commander to the proponent of the publications.

☐ An instrument flight evaluation will determine examinee's ability to perform duties of P, UT, IP, SIP or IFE (para 3-30b). This change was made to ensure that each aviator is evaluated on assigned duties. If he/she is an instrument UT, he/she will be checked on ability to instruct instruments. An IFE will be checked on his/her ability to evaluate an aviator on an instrument flight.

☐ An instrument flight examiner qualified and current in category may now administer an evaluation in any aircraft within that category. For example, an examiner qualified only in a UH-1 Huey may examine in an OH-58 Kiowa, AH-1 Cobra or CH-47 Chinook; however, paragraph 3-30b(3) and 3-21b(3) must be observed. This change occurred because of the limited number of IFEs at some installations.

☐ Flight into *forecast* severe turbulence is now authorized by paragraph 4-2c(2) only if MACOM commanders establish procedures for controlling flights within the affected areas. This change was made to permit flight training when a forecaster calls for severe turbulence over a very large geographical area and flights will be made in a relatively small portion of that area. For example, if all of South Korea is affected

by a severe turbulence forecast, the MACOM may authorize flights in areas which are checked and found to be free of severe turbulence. Even when authorized, a flight must either depart the turbulence or be terminated if severe turbulence is encountered.

☐ Paragraph 4-2c(5) authorizes aviators flying helicopters to reduce destination and alternate category A visibility minimums by 50 percent but not less than ¼ mile or metric equivalent. This 50 percent reduction is applied to alternate airfield planning and selection in paragraphs 4-2f and g by first reducing the visibility of the approach to be flown and then adding 1 mile. For example, the approach to be flown at destination has published category A weather minimums 300 feet and 1 mile. To determine if an alternate is required for a helicopter, reduce the visibility by 50 percent and add 1 mile; then add 400 feet to the 300-feet ceiling. This results in a minimum weather condition of 700 feet and 1½ miles. If weather is less than this, an alternate is required. When selecting an alternate airfield, the aviator first determines the weather minima for the approach to be flown at the alternate airfield. He/she may reduce the Category A visibility by 50 percent and then add 400 feet and 1 mile. In all alternate planning and selection, reduce the visibility first and then add the 1 mile.

☐ An approach for straight-in landing may be initiated regardless of ceiling and visibility. This change to paragraph 4-5b(5) is based on experience with the provision of the regulation that has for many years authorized continuation of an approach to DH or MDA if weather deteriorates after an approach is begun. This procedure is safe because obstruction clearance remains the same regardless of the weather. The most important consideration is that descent below DH or MDA will only be made per paragraph 4-5d.

☐ Practice hooded approaches may be made to the DH or MDA when the aircraft has dual controls and a copilot is at one set of the controls. Previously, paragraph 4-5b(9) required a copilot current in the aircraft being flown. Since a copilot instrument qualified only in category was required by paragraph 3-23c for flights in IMC, it is reasonable to apply the same rule to hooded flight.

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362; or call us at AUTOVON 558-3504 or commercial 205-255-3504. After duty hours call Ft. Rucker Hot Line, AUTOVON 558-6487 or 205-255-6487 and leave a message

NOTICE

The Night Hawk/Night Vision Goggles (NH/NVG) Exportable Training Package has become obsolete due to availability of an N/NVG Training Extension Course (TEC).

Unit TEC libraries desiring the new N/NVG Training Extension Course should request "Night Flight Training—BOI 166" from:

Commander
U.S. Army Transportation Center
ATTN: ATIC-ETP-T
Ft. Eustis, VA 23604

MAINTENANCE TEST FLIGHT EVALUATION

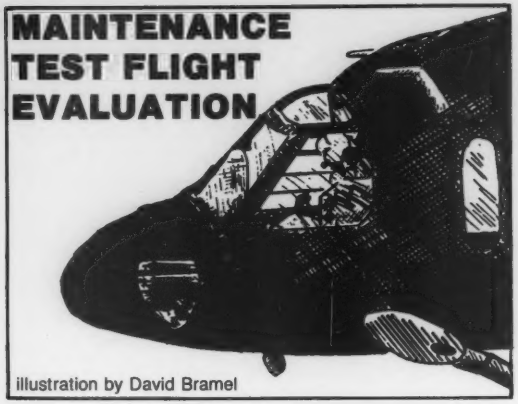


illustration by David Bramel

Lieutenant Colonel Harry J. McGinness
Chief, Maintenance Test Flight
Standardization Division
U.S. Army Transportation School
Fort Eustis, VA

Chief Warrant Officer, CW3, Ralph V. Winfrey
AH-1 Maintenance Test Flight Evaluator
U.S. Army Transportation School
Fort Eustis, VA

THE MAINTENANCE Test Flight Standardization Division (MTFSD) of the Directorate of Evaluation and Standardization (DOES), U.S. Army Transportation School, Ft. Eustis, VA, has completed its first year of test flight standardization evaluations worldwide. Although FM 55-44 was not officially implemented until April of this year, MTFSD has been conducting worldwide evaluations since August 1982.

In the July 1983 issue of *Aviation Digest* the article titled "Maintenance Test Flight Standardization" explained the purpose and background of the maintenance standardization program. This article will discuss the organization of the MTFSD evaluation team and how test flight evaluations are conducted.

The MTFSD evaluation team will consist of at least one maintenance test flight evaluator (MTFE) for each type rotary wing aircraft assigned to the installation or activity to be evaluated. The MTFEs are qualified and current standardization instructor pilots and graduates of the Aviation Maintenance Officer Repair Technicians Course, Phase I and II, with field experience as maintenance test pilots (MTPs). The evaluations are conducted in conjunction with the major command's Aviation Resource Management Survey (ARMS) and with Department of the Army directed visits to U.S. Army Europe and Korea.

These appraisals are made to determine the MTPs' knowledge of maintenance regulations and publications, general maintenance procedures, and proficiency in performing maintenance flight checks to the standards in FM 55-44. During the evaluation sequence, the MTPs' ability to perform normal pilot duties as prescribed in the appropriate aircrew training manual is also evaluated. The MTPs must maintain pilot proficiency in order to conduct a thorough and safe functional test flight. The areas of maintenance management and forms and records are not specifically included in the evaluation; however, any obvious weaknesses in these areas are noted and brought to the attention of the maintenance officer and the commander to assist them in improving their maintenance program.

Since 1 August 1982, the MTFSD DOES has conducted 293 MTFE/MTP evaluations. The breakdown of evaluations by type aircraft is shown in the figure.

Recurring areas of weakness have been emergency procedures, aerodynamics, troubleshooting and systems knowledge. These areas will continue to receive greater emphasis on future evaluations.

An aggressive evaluation and assistance schedule for fiscal year 1984 has been planned in coordination with the Directorate of Evaluation and Standardization, Ft. Rucker, AL, and the major Army commands' ARMS teams in order to provide commanders with an assessment of the proficiency of their test flight program. A functional and well established Maintenance Test Flight Standardization Program will help in improving your Aviation Maintenance Management Program. Let's keep it a test flight and not a stress flight.

Additional information may be obtained by writing or calling:

Commandant
U.S. Army Transportation School
ATTN: ATSP-ES-MTF
Ft. Eustis, VA 23604
AUTOVON 927-4164/3266

	AH-1	UH-1	OH-58	UH-60	CH-47
Satisfactory	51	97	68	28	18
Unsatisfactory	12	8	10	0	1
Total Evaluations	63	105	78	28	19

"Hangar Talk" is a quiz containing questions based on publications applicable to Army Aviation. The answers are at the bottom of the page. If you did not do well, perhaps you should get out the publication and look it over.

FM 1-301

Aeromedical Training for Flight Personnel

CW3 Gary R. Welland
Department of Combined Arms Training
U.S. Army Aviation Center
Fort Rucker, AL

1. What is the most plentiful gas in the earth's atmosphere?
a. Hydrogen
b. Nitrogen
c. Oxygen
d. Argon

2. An average adult human body contains about _____ pints of blood.
a. Six
b. Eight
c. Ten
d. Twelve

3. One of the symptoms of hyperventilation is cyanosis (blueness of the skin).
a. True
b. False

4. List the following modes of flight in order of least to most fatiguing.
a. Night vision goggles
b. Instrument
c. Chemical MOPP 4 protection
d. Day, nap-of-the-earth

5. The force acting on an object moving in a circular pattern, which holds the object on its circular path, is centrifugal force.
a. True
b. False

6. Carbon dioxide (CO_2), as a fire extinguishing agent, is nontoxic.
a. True
b. False

7. Some symptoms of _____ are cool skin with profuse perspiration and a rapid pulse rate.
a. Heat exhaustion
b. Heatstroke
c. Hypothermia

8. An individual will rarely notice noise-induced hearing loss until extensive hearing loss has occurred.
a. True
b. False

9. The site at which the optic nerve enters the eye is void of photosensitive cells and causes a night blind spot in the visual field.
a. True
b. False

10. What is the most common form of spatial disorientation?
a. Coriolis illusion
b. Leans
c. Autokinesis
d. Flicker vertigo

ANSWERS

1. b; para 2-3a
2. c; para 2-10
3. b; para 2-23a
4. b, d, a, c; table 3-2
5. b; para 4-1b (5)
6. b; para 5-3i (2)
7. a; figure 6-2
8. a; para 7-8a (2) (b)
9. b; para 8-3a
10. b; para 9-5a (1)

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Cathy Fancher photo by Reflections Studio

USAF TO 00-5-1

USAF Technical Order (TO) 00-5-1 has recently been distributed. The TO is only a 6-page document, but since it deals with the Air Force technical order system, it would be a good one to have around.

Inertia Reel Assembly

The inertia reel assembly, national stock number (NSN) 1680-00-775-4182, is a multiple application item used on UH-1, AH-1, OH-58 and CH-54 aircraft. In the past, it was managed as a nonrepairable item and disposed of at unit level. As a result of a recent U.S. Army Troop Support and Aviation Materiel Readiness Command value engineering proposal, it was recommended and approved that the supply, maintenance and recoverability code be changed to require turn-in of this item for repair at depot level. It was determined that this repair program was cost effective and would result in supply availability at a lower overall cost, resulting in increased readiness of this vital ALSE. When the inertia reel requires removal, the unserviceable reel should be returned to Sharpe Army Depot, Lathrop, CA 95330, RIC AQ5, W62G2T. TSARCOM Supply Letter Number 3383, dated 7 December 1982, covers this same subject.

Question and Answer

Dear PEARL, I am perplexed and hope you can help us aviation life support equipment users with a predicament we are facing. Can you tell me the proper maintenance procedures and repair tolerances of the CWU-27/P aircrew personnel flight coverall?

We are always glad to help and because we have had so many questions pertaining to maintenance and repair of aircrew personnel clothing, it seems users and in some cases commanders are not fully aware of the repair tolerances of this critical clothing:

- **FIRST**—TM 10-8400-201-23, TB 10-8400-252-23 and also FM 10-16, FM 10-30 and USAF TO 14P3-1-112 will provide information on this subject; so become familiar with these references.
- **SECOND**—The updated version of TM 10-8400-201-23 will clearly state garment shall be condemned when it no longer presents an acceptable military appearance from the standpoint of structural integrity to coincide with USAF TO.
- **THIRD**—Repair of Nomex flying coveralls shall be restricted to open seams, holes or tears, not in excess of 4 inches and replacement of hook/pile slide fasteners. Small holes or tears not in excess of ½ inch may be mended and/or darned on a sewing machine. To repair holes larger than ½ inch, but less than 4 inches, use patches. (Patches shall be Nomex fabric, NSN 8305-00-406-7499, color, sage green.) *But,* be sure to follow proper sewing procedures and use the proper Nomex thread. NOTE: TM 10-8400-201-23 is being updated to reflect proper information the same as USAF TO 14P3-1-112, since we are a user of the Air Force item of clothing. POC for additional information is Jim Angelos, AUTOVON 693-3112.

Parts Listing for Headset, NSN 5965-00-755-4656 P/N 10557

This is the gray headset used by ground crew personnel on the flight line and ramp area. They are normally not authorized the SPH-4 helmet. This headset provides noise protection as well as a communication capability. It is also used by aircrews in some fixed wing aircraft when the SPH-4 is not required. Air Force Technical Order 12R2-2AIC-222 covers maintenance and parts information on this headset. This headset should not be disposed of when it

becomes unserviceable. Recommend that it be turned in for repair, using the AFTO as authorization. Savings will be about $65.00 on each headset repaired.

SPH-4 Helmet Microphone Boom

The SPH-4 helmet microphone boom rotation problem can be solved. Natick Laboratories (NLABS) has come up with a value engineering proposal to adhere the microphone boom slotted washer to the inside of the helmet shell if the microphone boom rotates too freely. The following procedure was found to work quite well.

1. Abrade one surface of the slotted washer and the corresponding surface of helmet shell with #80 grit sandpaper.

2. Clean both areas using a cloth with denatured alcohol; allow to dry.

3. Apply a thin coating of 3M EC-1357 or equivalent adhesive to both surfaces; allow to dry 3 to 5 minutes. Adhesive should have set and helmet ready for use within 2 hours. The 3M EC-1357 adhesive should be available in 5 ounce tubes through your local 3M distributor.

4. Reassemble microphone boom hardware snugly.

NOTE: Should more information be desired, point of contact at NLABS is the project engineer for the SPH-4 helmet, Mr. Bruce Buckland, AUTOVON 256-5580 or Commercial (617) 651-5580.

SPH-4 Helmet Retention Assembly Sizing

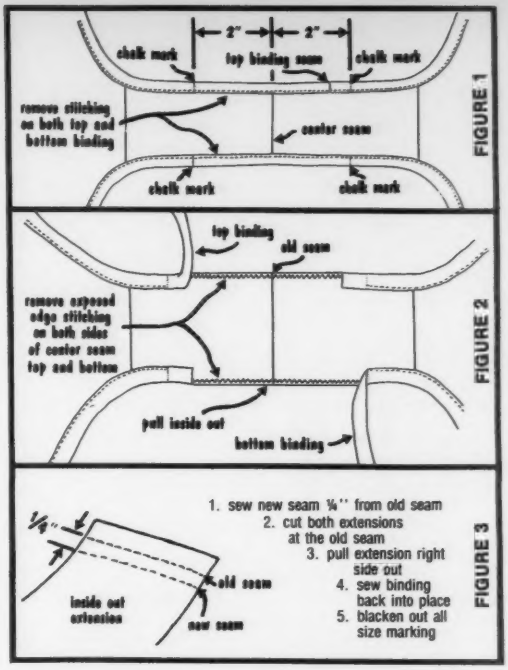
Regular size retention assemblies are out of stock. The extra large (XL) retention assembly, NSN 8415-01-056-0699 is available in quantity; as an interim solution to the out of stock regular size, the following alterations may be used as needed.

With the retention assembly removed from the SPH-4 flyer's helmet, use the following procedures to accomplish the alterations:

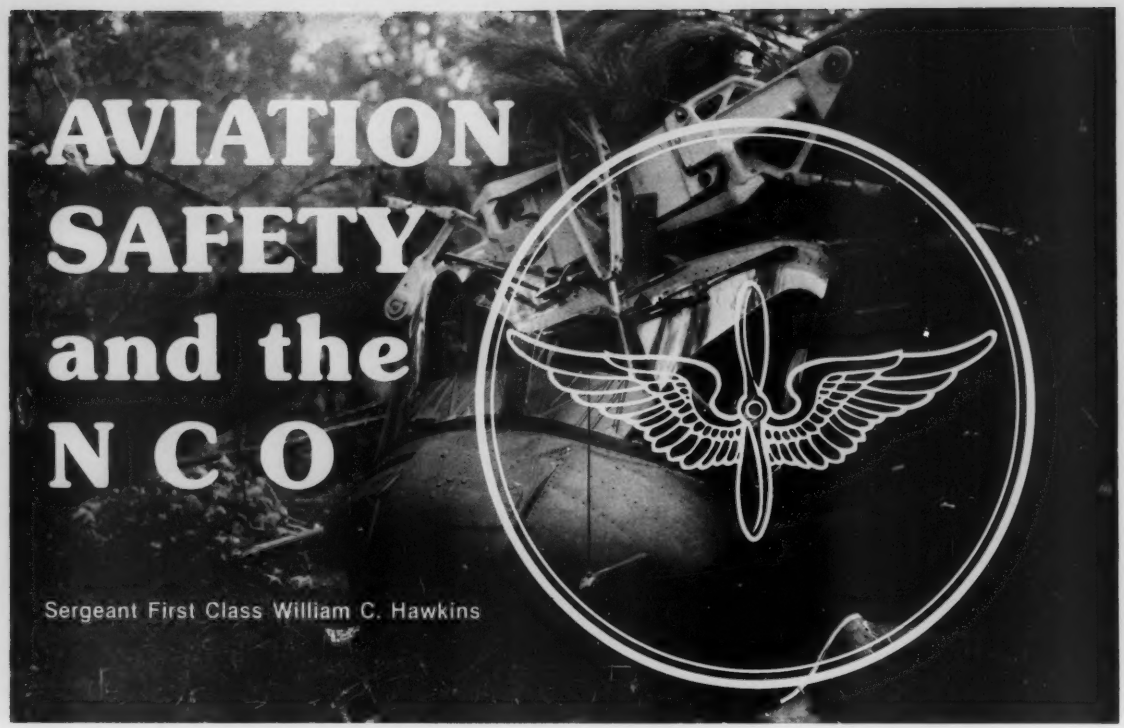
- Unfasten buckle from the nape strap.
- Apply a chalk mark 2 inches on both sides of the center seam on the top and bottom binding (figure 1).
- Carefully remove stitching from the top and bottom binding, taking care not to cut or damage either the binding or the fabric (figure 1).
- With the binding loose from the retention assembly, cut the lower binding (opposite end from top binding seam). On the upper binding remove stitching up to the point of overlap. Peel back the binding, exposing the outer edges of material (figure 2).
- Remove the edge stitching from the top and bottom of fabric 2 inches on each side of center seam, turn each edge of material inside out after edge stitching has been removed (figure 2).
- Using FED-VT-295, type I, class I, subclass A, size E, olive drab, nylon thread, seven to nine stitches per inch, sew new seam on each layer of material ¼ inch in from existing seam, cut fabric at old seam and turn each layer right side out (figure 3).
- Using original stitch pattern, resew upper and lower edge of fabric.
- Resew binding to material overlapping as required.
- Reinstall nape strap through buckle.
- Mark out NSN and XL with black laundry marker.

Altered XL retention assembly will now fit regular size SPH-4 flyer's helmet. Alteration procedure is used to eliminate excessive bunching of material under nape strap.

If additional information is desired, your point of contact at TSARCOM is Mr. Jim Angelos, DRSTS-MCAPL, AUTOVON 693-3112 or Commercial (314) 263-3112/3114.



If you have a question about personal equipment or rescue/survival gear, write PEARL, DARCOM, ATTN: DRCPO-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120 or call AUTOVON 693-3307 or Commercial 314-263-3307



AVIATION SAFETY and the N C O

Sergeant First Class William C. Hawkins

HE REALLY shouldn't be flying this mission. He had flown 4.6 hours yesterday with 1.1 of that at night and worked 'till almost midnight at home on the staff study for the "old man." Although well within crewrest minimums, he was tired.

Oh well, at least the weather was going to be good for the unit party. That was really the reason he was flying. The duty officer had asked if he would trade duty days with him so he could take his fiancee to the party. He accepted the offer only because his wife was on duty today at the hospital and would not be able to attend.

Normally, standby duty was 24 hours of catching up on paperwork or doing chores at home. But at 0645, he was called by the charge of quarters (CQ) to tell him they had a medevac mission. It seems that a soldier assigned to an infantry unit, which was conducting a field exercise in the local area, had fallen into a ditch and was complaining of severe back pains. Another unit had received the initial call and had dispatched an aircraft, but the crew had declared a precautionary landing and requested that his unit take the mission so they could recover their aircraft and its crew. He told the CQ to alert his copilot (CP)—a new second lieutenant fresh from Ft. Rucker—and to call maintenance and get him an aircraft.

When he arrived at the airfield, his CP had filed the flight plan and was almost finished with the preflight. He was informed they wouldn't have a crewchief—who had been detailed to help prepare for the unit party. They went ahead and cranked up and started a radio check. Just then his train of thought was interrupted by the intercom.

"Sir, I'm getting a funny 'buzz' in the pedals."

"OK, Mike, I have the controls."

"You have the controls, sir."

The pedals did have a slight "high freq" but this "old bird" was known as a "hangar queen," and he really didn't want to sit in a field waiting for a ride back. But, the injured man had been waiting for more than an hour.

"OK, Mike, you have the control...and the pedals do have a slight high freq but it's because this 'old beast' is a real hangar queen. You did check the tail rotor on preflight?"

"OK, sir, I have the controls, and roger on the tail rotor check."

"Roger, let me give you a quick brief on the pickup zone (PZ). I've been there before and it's small, big enough for two ships max, not a 'hover hole,' but small. It's surrounded by trees 60 to 70 feet tall, so the approach will be steep and slow, with extra power. I want you to stay above ETL (effective translational lift) until the last possible moment. With the winds today, your best approach will be from the west—and—uh, I'd better call the ground unit. We're almost there. Yep, there's the smoke at eleven thirty hours...you got it?"

"Roger, the smoke...at about two kliks...OK, sir."

"Delta, Seven X-Ray...this is Sultan, Zero Three..."

"Sultan, Zero Three, this is Delta Seven X-Ray, go ahead."

"Roger, Seven X-Ray, I'm with you about one klik west at 1,000 and we have your smoke in sight."

"Sultan, Zero Three, this is Delta, Seven X-Ray. Roger—the patient is ready and the PZ is clear."

"Roger, Seven X-Ray, and I don't have a crewchief so you'll have to load him, and uh, don't approach the aircraft from the rear."

"Roger."

"OK, Mike, before landing check rpm 6,600; systems check, crew passenger and mission equipment checked, landing light on."

"Roger."

As the aircraft approached the edge of the trees that surrounded the PZ, he felt the shudder as the aircraft approached ETL.

"OK, Mike, a little forward cyclic, keep it going down."

Then he heard a noise and felt a thump from the rear of the aircraft. The nose of the helicopter immediately began a yaw to the right.

"OK, more left pedal there, keep it straight."

Then there was a loud BANG from the rear of the aircraft, and the nose of the aircraft began a rapid spin to the right and pitched down. Time seemed to slow and everything assumed a dreamlike quality.

"I have the controls!" He grabbed the controls, added full aft cyclic and retarded the throttle to the idle detent. He had to get the nose straight and try to cushion it! He knew he didn't have enough time to lower the collective to regain rotor rpm.

The nose started back to the left, and he pulled the collective to the top. He knew, somehow, they weren't going to make it. The master caution and rpm warning lights were illuminated and he could hear the low rpm audio. He saw Mike throwing his arms up to cover his face. He watched as the retreating blade struck the ground, the cyclic was ripped from his hand by the force of the blade impact and banged violently around in the cockpit hitting the inside of both his thighs. He could now see the grass of the PZ through the windscreen. The last thing he saw was the attitude indicator and the word "DIVE."

The probable cause of this mishap was found to be as follows:

Task Error or Failure/Malfunction: UH-1H Huey maintenance supervisor (E7) provided a helicopter for a day visual flight rules medevac mission with inadequately performed required maintenance. The aircraft was assigned to fly with the tail rotor (TR) pitch change (PC) link retaining bolts installed backwards, the nuts were not properly torqued and the cotter pins were not installed. The nut backed off during flight and one PC link retaining bolt separated causing an imbalance in the tail rotor system. The imbalance resulted in a severe vibration in the TR assembly and subsequent total separation of the assembly to include 90-degree gearbox (the assembly was found in the edge of the trees surrounding the PZ). The loss of the TR assembly caused a forward shift in the center of gravity and total loss of tail rotor thrust during an extremely critical portion of the approach into a confined PZ. This mishap resulted in total loss damage to the aircraft and two fatalities.

System Inadequacy

- UH-1H general mechanic (E3) inadequately performed required maintenance. (Improperly reinstalled TR, pitch change link retaining bolts following TR blade grip purge after aircraft was washed.)
- Unit technical inspector (E6) failed to perform required post maintenance inspection and improperly signed the task off as completed.

NOTE: The findings of this investigation are, for reasons of brevity, obviously incomplete. The accident investigation board using the 3W approach (what happened, what caused it, what to do about it) would find many other human errors that would be contributing factors; i.e., failure of the pilot in command to ensure that a proper preflight inspection was completed. This mishap is fictitious and a product of the author's imagination. But, given the failure of noncommissioned officers (NCOs) to properly do their jobs, it is not so farfetched to be all too real.

The capabilities of today's NCOs far exceed, I'm sure, the expectations of General George Washington and Baron Von Stueben. The NCOs in today's Army are better trained, equipped, paid and possess more technical expertise and leadership ability than any NCO in the history of the military. But with all the advances we've made through the years, we still have some challenges. During the period fiscal year (FY) 1978 through FY 1982, 5 percent of

AVIATION SAFETY and the N C O

all human error Army Aviation mishaps were attributed to *ground crew,* which led to eight Army fatalities. We continually hear commanders say, "Our safety record is better than it has ever been" or, "Our mishap rate is only 2.4 per 100,000 hours." In most cases this is true, and it's always nice to see improvement. For the U.S. Army the only acceptable loss is a combat loss, and the Army's NCOs must do all that they can to assist commanders to keep the mishap rate at zero. As a minimum, we must eliminate that 5 percent of mishap cause factors that can be attributed to our area of responsibility.

"The NCO is the backbone of the Army." We've all heard that statement and although I'm a bit prejudiced, I fully agree. Now, I'm not about to use this article as a platform from which to preach the duties, responsibilities and authority of the NCO. But, I will say that the NCO's attitude, job knowledge and personal actions can and do have a direct impact on the unit's safety record and effectiveness. Aviation has its inherent hazards. Let's face it, we weren't born with wings. But we do possess the knowledge, experience and expertise to reduce those inherent hazards.

Earlier in this article I mentioned the 3W approach to the investigation of my fictitious mishap. I talked, albeit briefly, about *What* happened and *Why* it happened. I would now like to offer some ideas on *What* we (the NCOs) are to do about it. We must get ourselves and our soldiers involved in the Army safety program. Don't wait for an engraved invitation to the safety meetings. Just go! And have positive input.

Conduct your own safety meetings. They don't all have to be a structured formal presentation. I've found that a good old-fashioned "bull" session with the troops can accomplish a lot. When your troops talk, *listen.* I think, at times, we tend to forget we were once privates and sometimes don't listen closely enough to our soldiers. When your soldiers offer suggestions or report hazards, respond in a positive manner. Any hazard, actual or perceived, continues to be a hazard, at least in the eye of the beholder, until it is clarified or removed.

When soldiers report these hazards, recognize their efforts. Everyone likes an occasional "attaboy." By the same token, do not overlook "minor" safety infractions by your personnel, or those infractions that are "outside" your particular area of responsibility. When we find these hazards, we should take action to correct them or the soldier that may make the mistake. The key to a good safety program is "prevention through education and training," and when it relates to the soldier that is "sergeants' business" and our responsibility.

We must stress teamwork and mishap awareness to our soldiers and fellow NCOs. No matter how small the part played by a soldier in the overall team function, a failure of that part will affect the entire team.

The unit commanders by regulation are the safety managers and have final responsibility for the actions of their personnel and their unit's safety record. The aviation safety officers are the commanders' technical advisors for accident prevention. But, let's face facts. We, the NCOs, are responsible for the largest group of personnel in the unit—the soldiers—and *we* can have the greatest impact on unit effectiveness.

I would like to offer some challenges to the commanders, safety officers and NCOs. To the commanders and safety officers: In your NCOs and soldiers you have valuable safety assets, please don't waste them. To the NCOs: *Get involved* and get your soldiers involved. Finally, our mishap rate so far this FY is better than last year's and, while we obviously will not have a zero rate, that always *must* be our goal.

ABOUT THE AUTHOR

Sergeant First Class Hawkins is currently serving as the NCOIC, Lowe Division, Department of Flight Training at the U.S. Army Aviation Center, Ft. Rucker, AL. He has been involved in safety work for more than 8 years and has had one previous article published in the *Aviation Digest,* "Pilot Error, Human Error," September 1982.

Remembrance and Reality—

The OH-58 Story

Lieutenant Colonel Donald E.S. Merritt
Readiness Project Officer
U.S. Army Troop Support and Aviation
Materiel Readiness Command
St. Louis, MO

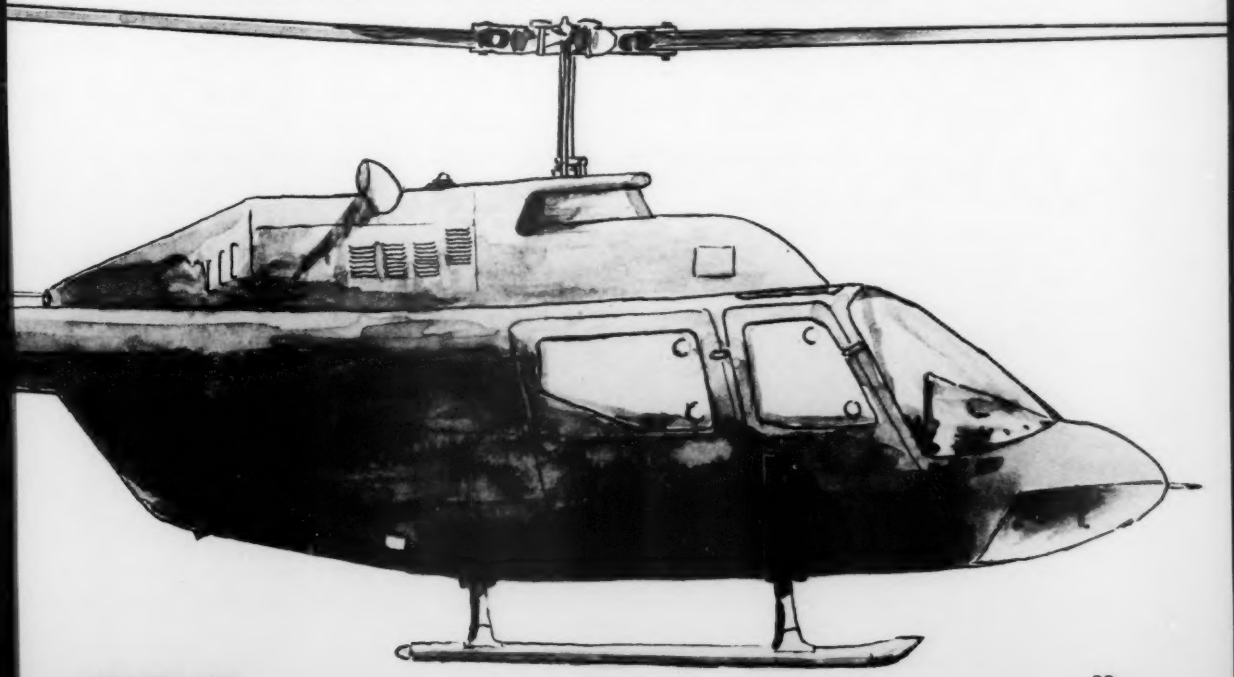
THE YEAR IS 1981 in Germany. The scene, familiar to every aviator, is the dimly-lit, built-by-the-user, officers' club. The faces are young, fresh and ready for action, but the camaraderie and conversation are reminiscent of pilot hangar talk a few years after World War II or the Korean War.

Three stools down, still wet with perspiration from a hard day of border patrol flying, sits CWO Mike Cirone describing in detail how it was in Vietnam the day he drew murderously heavy hostile fire from a nearby treeline. Notice how calm he is. Observe the full rich tone of his baritone voice and the steady hand movements as he deftly displays the maneuvering tactics used to extricate himself from "the situation."

Enter now the equipment being used in CWO Cirone's saga of deering-do. As a steely-eyed scout pilot, he was flying the OH-58A Kiowa which was designed to perform the varied missions of administrative coordination, liaison, light logistical resupply, artillery spotting and general observation.

The OH-58A was shipped to Vietnam while still "wet-behind-the-ears." In Vietnam, it was immediately thrust into a demanding aeroscout role *for which it was not designed,* but which it could fill because of the low intensity warfare environment.

Since Vietnam, many tests and exercises have validated the aeroscout concept, clearly demonstrating the need for a small, agile and survivable helicopter to be the eyes and ears of the battlefield. At the same time, the limitations of the OH-58A as an aeroscout were accentuated by expanding mission requirements which resulted in much public comment by the ultimate users, the scout pilots. Basically, these comments centered around three major concerns scout pilots had about the OH-58:



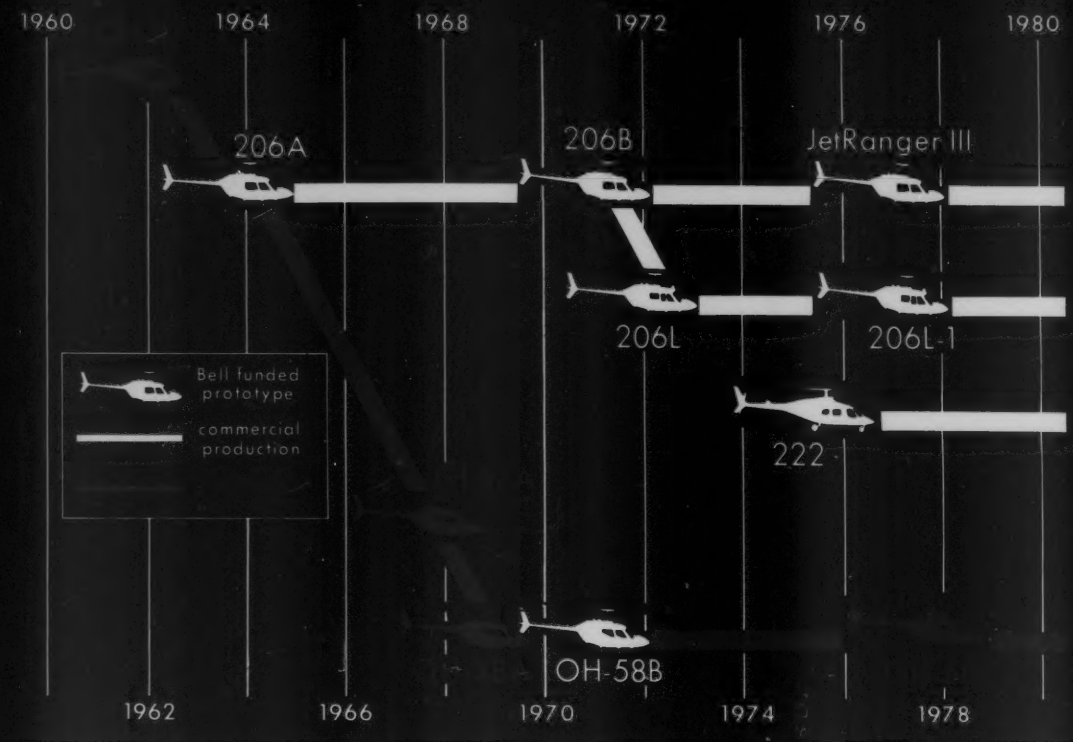


FIGURE 1: Prototype development and light observation helicopter evolution.

- Its construction doesn't lend itself to "crashing well."
- Its inadequate armament makes it susceptible to small arms fire.
- It is unsuited for its mission/use as a scout for the AH-1 Cobra.

Understanding the concerns listed above requires some background history. The OH-58A entered Army service as a result of competition initiated by an RFQ (request for quotation) issued by the Army in January 1968. This request called for a helicopter meeting the stated requirement for a light observation helicopter (LOH).

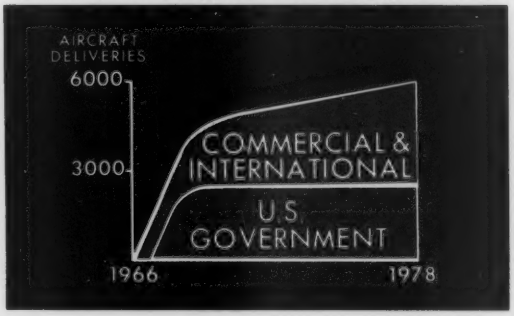
Sixteen months later, May 1969, we saw delivery of the first OH-58 aircraft, followed by their deployment to Vietnam in August 1969 and others to Europe that October.

Bell completed delivery of the OH-58A in 1973. This relatively short time from competition to contract fulfillment needs some explanation.

In the 1960s the Army had held a full LOH competition which was won by Hughes Helicopters' OH-6A Cayuse. Hughes was subsequently awarded a production contract under which it fielded the "Little Bird" which became so well liked in Vietnam.

The OH-58A is a derivative of the OH-4, Bell's entry into the original LOH competition. After the LOH competition, Bell developed the 206 (Jet Ranger) series of helicopters for the commercial market. This led to

FIGURE 2: More than 6,000 Bell 206 Jet Rangers delivered.



several models, including the OH-58A (figure 1).

A second competition was held between Bell Helicopter's OH-58A and the Hughes' OH-6A with the OH-58A being selected as the "new" LOH aircraft. A contract to produce 2,200 aircraft was issued to Bell Helicopter Company in March 1968.

Fourteen years have elapsed since the OH-58A first entered the Army inventory as a light observation helicopter. Those years have seen the OH-58, and its civilian counterpart (the Bell 206 Jet Ranger), pass a thorough operational analysis and evaluation of its designed role as a light observation helicopter.

More than 3,800 of this type helicopter have been delivered to commercial and international customers. This large commercial fleet represents a definite advantage to the Army, since many flight hours of experience are available from which to make improvements (figure 2).

Like all aircraft, the OH-58A has had its share of growing pains. One of the more severe pains, and one that is still with us, has to do with reports of insufficient engine power, especially on a hot day. This same complaint was voiced to Bell by commercial 206 (Jet Ranger) operators.

Bell responded by qualifying a larger engine for the civil fleet. The Army, however, continued with the then installed engine, because at that time no formal requirement had been written for the more stringent aeroscout role. A footnote to the engine story is that in 1973 a product improvement program (PIP) for the OH-58A was approved. If carried through, this would have installed the larger engine, but because there was no formal requirement, the PIP was never funded.

In most other areas of interest to the Army, the OH-58A was (and is) outstanding. Its maintainability, measured by the component removal rate for six major components during the time period 1969 to 1974, was better by one-third than that of other similar aircraft. This low removal rate contributed to the aircraft's better than usual availability rate. In the same way, its crashworthiness, one of the major concerns voiced by scout pilots and perhaps the most time dimmed remembrance of them all, is substantiated by statistical figures furnished by the U.S. Army Safety Center.

The LOH's safety record, given the manner and the environment in which they are operated, is impressive. Accident rates are shown in figure 3 for 1974 through

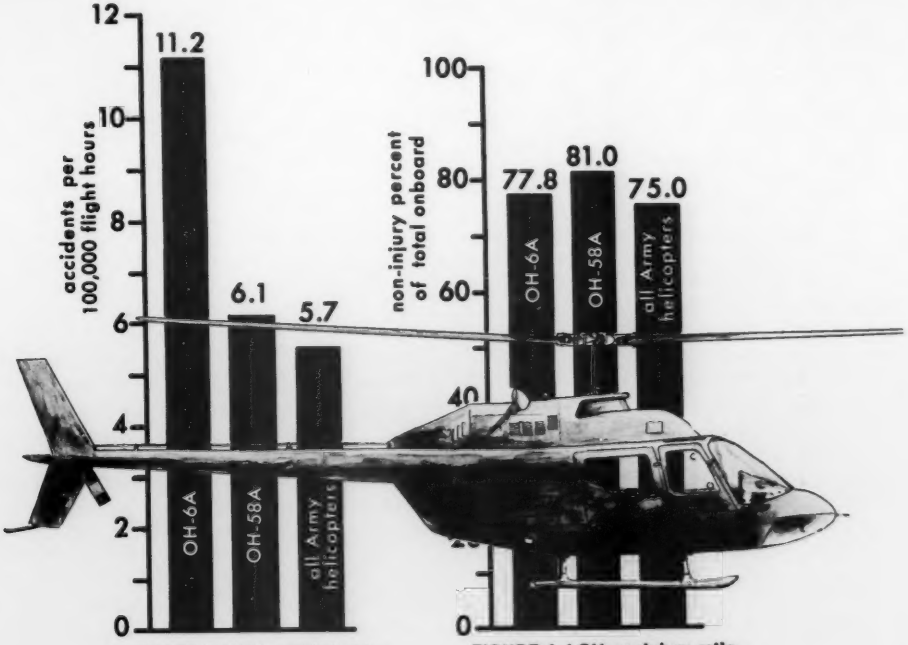


FIGURE 3: LOH accident rate from 1974 through 1978.

FIGURE 4: LOH noninjury ratio from 1974 through 1978.

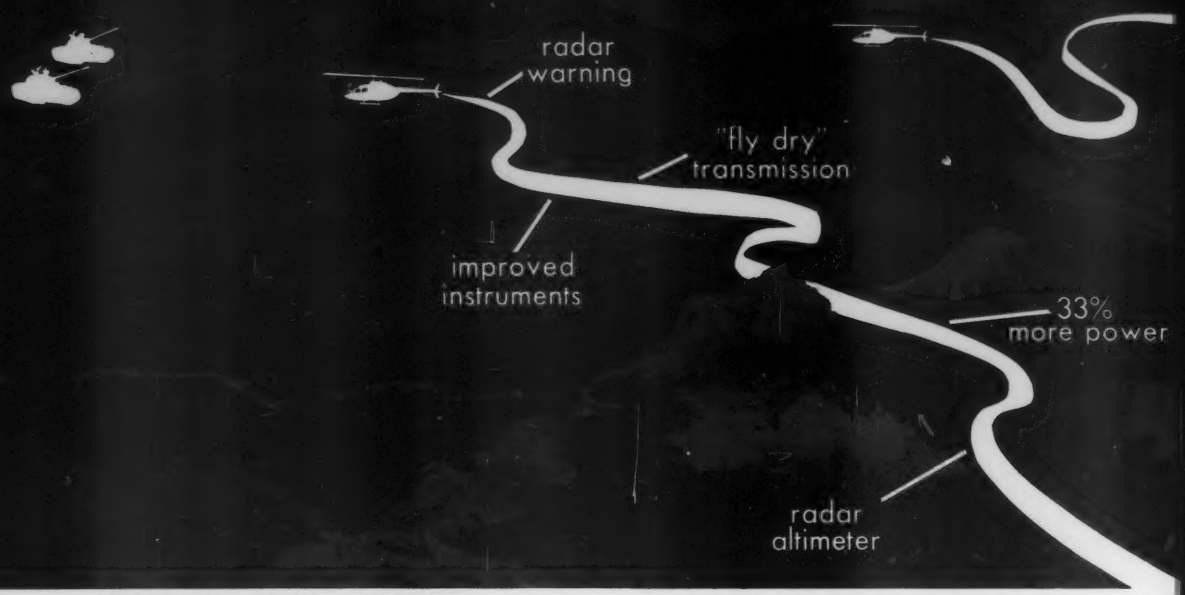


FIGURE 5: Improvements for the OH-58C.

1978. The bottom line in crash survival is how many people escape serious injury (including death) in accidents. Therefore, the number of people not seriously injured as a percentage of the number of people exposed to the accidents, is an indicator of the overall crash survival characteristics of a helicopter. The LOH noninjury ratios (figure 4) are both better than the Army helicopter average. Despite these qualities, several factors made it necessary to modernize the OH-58A.

First, one of its primary missions had changed dramatically. There was a shift in emphasis of the aeroscout role from the "brush fire" unsophisticated battlefield to the AirLand Battle of tomorrow which will be fought on a highly sophisticated, electronic battlefield. The need for an improved aircraft capability can be fully appreciated in light of the shift of national defense priorities which require the aerial scout aircraft for artillery and air cavalry to interface with attack helicopters while performing and surviving in the European high threat environment (figure 5).

Second, the OH-58A fleet had accumulated more than 2,411,000 flight hours. This high experience level identified some potential areas for improvement which have had large life cycle cost benefits. Additionally, the millions of flight hours flown by the OH-58A's civilian counterpart have led to advancements in components.

In 1974, the Army Scout Helicopter Special Task Force stated that a requirement existed for an advanced scout helicopter but that the OH-58A could be modified (improved) to serve an interim role. The requirements document stripped the aircraft of its weapons: It is supposed to be the eyes and ears of the force, not a fighter. The task force final report and recommendations began the process leading to an interim scout helicopter, the OH-58C.

Early in 1976, the Army and Bell Helicopter Textron entered into a contract to design, develop and procure 12 modification work orders (MWOs) to be applied on OH-58A aircraft. These MWOs, some of which had previously been approved as PIPs, but never funded, were provided as separate kits which could be installed by depot level maintenance. Some of these MWOs were designed and built under Army contract by Bell while others were provided by the Government (Government furnished equipment). Contract orders for initial kits were issued in March 1976 with delivery in 1977. A development contract to modify and conduct qualification testing of the OH-58C (as the OH-58A is known with MWO kits installed) was signed by Bell Helicopter Textron in July 1976. The first OH-58C was delivered to the Army for pilot training in August 1978. These kits enhance the power and survivability and upgrade the mission equipment package while providing many pluses (figure 6) for the modern Army aviator.

The Army plans to modify 585 OH-58As with these MWO kits and to redesignate them as OH-58Cs. The initial contract for the modification of the first group of 275 aircraft was completed in early 1982. A follow-on contract for 160 aircraft was awarded to Bell in February 1982. Additionally, 150 aircraft will be modified in the fiscal year 1982 to 1984 timeframe to

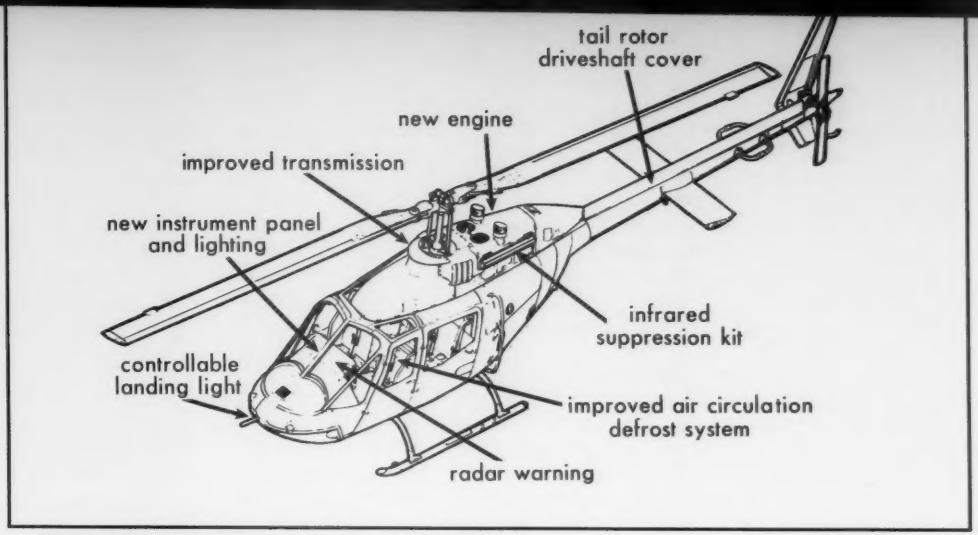


FIGURE 6: Equipment improvements for the OH-58C.

satisfy Europe's scout requirements.

The Initial System Assessment/Disciplined Review of the OH-58C conducted by the U.S. Army Materiel Systems Analysis Activity for U.S. Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) late in 1981 established a generally agreed upon position that the aircraft is a simple, reliable, easily maintained aircraft. The review did establish, however, that the current configuration is marginally acceptable for performance of the interim scout mission. Deficiencies in directional control and marginal low-speed handling qualities prevent the required nap-of-the-earth mission from being performed over the complete range of the desired operating envelope. Additionally, one of the major areas of complaint by the user still exists—the OH-58C does not possess a target acquisition system to make it compatible with the AH-1S. The scouts must rely on their own (often unaided) eyes to provide target detection, recognition and identification. These combined problems detract from mission capability while calling into question the credibility of our scout/attack helicopter team doctrine, in that a team with the capabilities required to make the doctrine workable does not yet exist.

The System Improvement Plan (SIP), Section VIII, of the Initial System Assessment/Disciplined Review, was concurred with by the U.S. Army Forces Command, U.S. Army Training and Doctrine Command and the Aviation Center on 2 September 1981. The SIP addresses the deficiencies noted above by stating that control and handling qualities problems can be alleviated by the combination of two modifications:

- An improved tail rotor system having increased thrust capability (PIP 1-79-01-0215).
- A three-axis Stability Control Augmentation System which will sense changes in force inputs and attitudes, process the inputs and send corrective outputs through actuators to the control system (PIP 1-80-01-0225).

The initial effort to achieve these modifications has been initiated with a $5.2 million contract to Bell Helicopter for systems integration work. The visionics deficiency, also identified as a major mission capability deficiency by the Scout/Observation Helicopter Joint Working Group which was conducted at TSARCOM during September and October 1981, called for providing a visionics capability equal to that available to the AH-1S. To this end, the U.S. Army Armament Research and Development Command has performed a comprehensive market search of the various visionics alternatives and is vigorously working with TSARCOM to define a recommendable system.

The effort expended to field and product improve the OH-58C is pointed toward one goal—to provide the aeroscouts of attack helicopter and air cavalry units with an adequate interim capability—within dictated fund constraints—which allows them to fulfill their roles on the AirLand Battlefield.

The year is now 1983. Our stalwart hero CWO Cirone, being a normal hardcharging aviator, is now a captain, assigned back to his old unit as the operations officer. The unit has some of the new round-canopy OH-58Cs, thanks to the TSARCOM European modification program being done in Brussels, Belgium, by Israeli Aircraft Industries. This 150-ship effort will add considerable capability to Europe's defensive posture as they join the 48 flat-plate canopy OH-58s already in Europe. Captain Cirone is enthusiastic about the improvements in the OH-58C and the increase in mission potential these improvements offer.

Captain Cirone has just ordered a cool one in the same officers' club where we last saw him 2 years ago as CWO Cirone. He has a worried look on his face and is deep in thought about certain aspects of his new job when the conversation of a couple of "wobbly ones" nearby penetrates his conscience like a turbine blade thrown through an engine case. "No power margin," "N^2 power droop," and "loss of tail rotor effectiveness" are snatches of the conversation that cause him to mentally brake.

He remembers the TWX back on his desk that had caused the worried look that he wore and that had plunged him so deeply into thought. The TWX was a reminder to all operations officers that the OH-58 family of aircraft currently were experiencing some very real problems. He remembered that this wasn't the first time he had heard about the OH-58's penchant to swap ends or unexplainably bleed off rotor rpm. He had gotten this same information at Ft. Rucker during the refresher course he took prior to reporting for his new assignment. He had had an opportunity at that time to read a number Aviation articles* concerning these phenomena as well as the opportunity to view an excellent videotape produced by the Aviation Center on the problems with the aircraft.

The just overheard conversation set straight in his head the new job questions he had been pondering before. He now knew what direction he would take. He slowly and deliberately rose from his chair and turned toward the two newest aviators in the unit. He introduced himself by saying, "Gentlemen, I overheard your conversation just now about the OH-58. I know your concern about the characteristics the aircraft is exhibiting, and I want to share with you some information I think will enable you to better cope with the kind of thing you have heard is happening to other pilots. Please meet me in the operations shack at 0800 tomorrow and we'll discuss the subject."

Promptly at 0800 the next morning the captain, his aviation safety officer (ASO), standardization instructor pilot (SIP) and the two conversationalists from the previous evening were sitting around the table with steaming cups of coffee in front of them.

The captain started the conversation, "What I heard last night indicated to me that neither of you were comfortable flying the OH-58. Is that right?"

Both pilots nodded their heads, yes.

"I thought that might be the case and I would bet that you aren't the only ones in this unit that feel that way. I think your awareness of the problems is a healthy thing, and I view it as my job to provide you with all the information available on these problems so your awareness can become an asset to you and not a liability. In order to do that, I want the ASO to review with you, as he will do with every pilot in the unit, certain *Aviation Digest* articles on the various problems, and also show you a new videotape that provides practical advice on how to recognize the onset of these problems, and offers suggestions on procedures to counter the problems.

"After you have thoroughly gone through a detailed discussion of this material with the SIP and the ASO, the SIP will set up for each of you, as he will do for each new member of this unit, an on-the-job training program with one of the experienced pilots. You will not be allowed to fly single pilot missions until this training is completed. You and all the other unit pilots need to learn how to fly the aircraft properly. The OH-58A is underpowered, and it does lack sufficient tail rotor thrust for the highly demanding job which we give it. The OH-58C, while having plenty of power, still has the same tail rotor as the OH-58A. Therefore, it has the same problem—although in the C model it is not as bad as it is in the A. But with proper training and good mission planning, both on your part and mine, you can safely fly the aircraft and do your mission at the same time. It's my job to make sure that happens. Any questions?"

Weeks later as the captain enters the legendary officers' club, he is accosted by one of the wobbly ones with whom he had started his much heralded and highly visible "back to basics" training. The young man started off by saying, "Sir, I flew my first single pilot mission today. I want you to know that I was perfectly comfortable during the entire flight. We were in and out of some tight places today, as well as being down in and among the trees, but with the control touch, wind direction awareness and power available computing training we've been given, I was not overly anxious, and I was aware of where I was and what I was doing. Thanks for making me safe for myself, sir." And with that, he walked off.

The captain sank down in one of the old, well-worn chairs which reminded him of his own age right then. As he sipped his usual, he flashed back to that day years ago in Vietnam when he, as a young warrant, had expressed to a more senior and experienced pilot much the same sentiment after their miraculous escape from some murderously heavy treeline hostile fire.

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*FLIGHTFAX, Volume 6, No. 46, dated 13 September 1978, subject: OH-58A Tail Rotor Stall.

U.S. Army Aviation Digest, September 1977, "How to Crash by the Book."

U.S. Army Aviation Digest, November 1978, "OH-58 Tail Rotor Stall."

U.S. Army Aviation Digest, June 1980, "Tail Rotor Breakaway."

U.S. Army Safety Center message, 241925Z October 1978, subject: Inadequate Tail Rotor Thrust in OH-58A Aircraft.

U.S. Army Aviation Digest, December 1982, "OH-58 Power Droop."

U.S. Army Aviation Digest, March 1983, "OH-58 Tail Rotor Control Power."

Copies of the *Digest* articles are available upon request. Write Editor, *U.S. Army Aviation Digest*, P.O. Drawer P, Ft. Rucker, AL 36362.

U.S. Army Communications Command
ATC ACTION LINE

National Airspace System Plan (NASP) Update on Air Route Traffic Control Centers

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FAA INTERCOM, which is published by the FAA Office of Public Affairs, has reported the NASP now calls for the retention of all 20 air route traffic control centers in the conterminous (48 adjacent) United States as the nucleus of the future air traffic control system. The centers will be redesignated as Area Control Facilities and given the additional responsibility of providing terminal radar control services for virtually the entire country.

The revised NASP drops the earlier approach of reducing the number of domestic centers from 20 to 16 and consolidating the 188 terminal radar control rooms into some 30 regional or hub TRACONs. The new concept is for the Area Control Facilities, augmented as necessary, to provide all radar services with individual airport towers continuing to direct actual takeoffs and landings. The total number of Area Control Facilities would be about 23.

Evaluation of the Area Control Facility concept will occur during the 1990s and will depend upon the availability of the new sector suites (controller work stations with separate displays of traffic and weather, flight data and advance planning information). However, construction activity to expand the centers to accommodate their new responsibilities will get underway in 1985.

The INTERCOM also says that the Hazardous Inflight Weather Advisory Service (HIWAS) is going national after a successful 1-year test in the Miami and Jacksonville en route center areas. Nationwide implementation will start in 1984 and continue into 1987. Coverage will be provided at 4,000 feet AGL.

HIWAS provides hazardous weather data to pilots on a continuous basis through recorded broadcasts on VOR voice channels, thus relieving the burden from controllers and flight service specialists. Broadcasts include SIGMETs, AIRMETs and urgent PIREPs.

Readers are encouraged to address matters concerning air traffic control to:
Director, USAATCA Aeronautical Services Office, Cameron Station, Alexandria, VA 22314

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